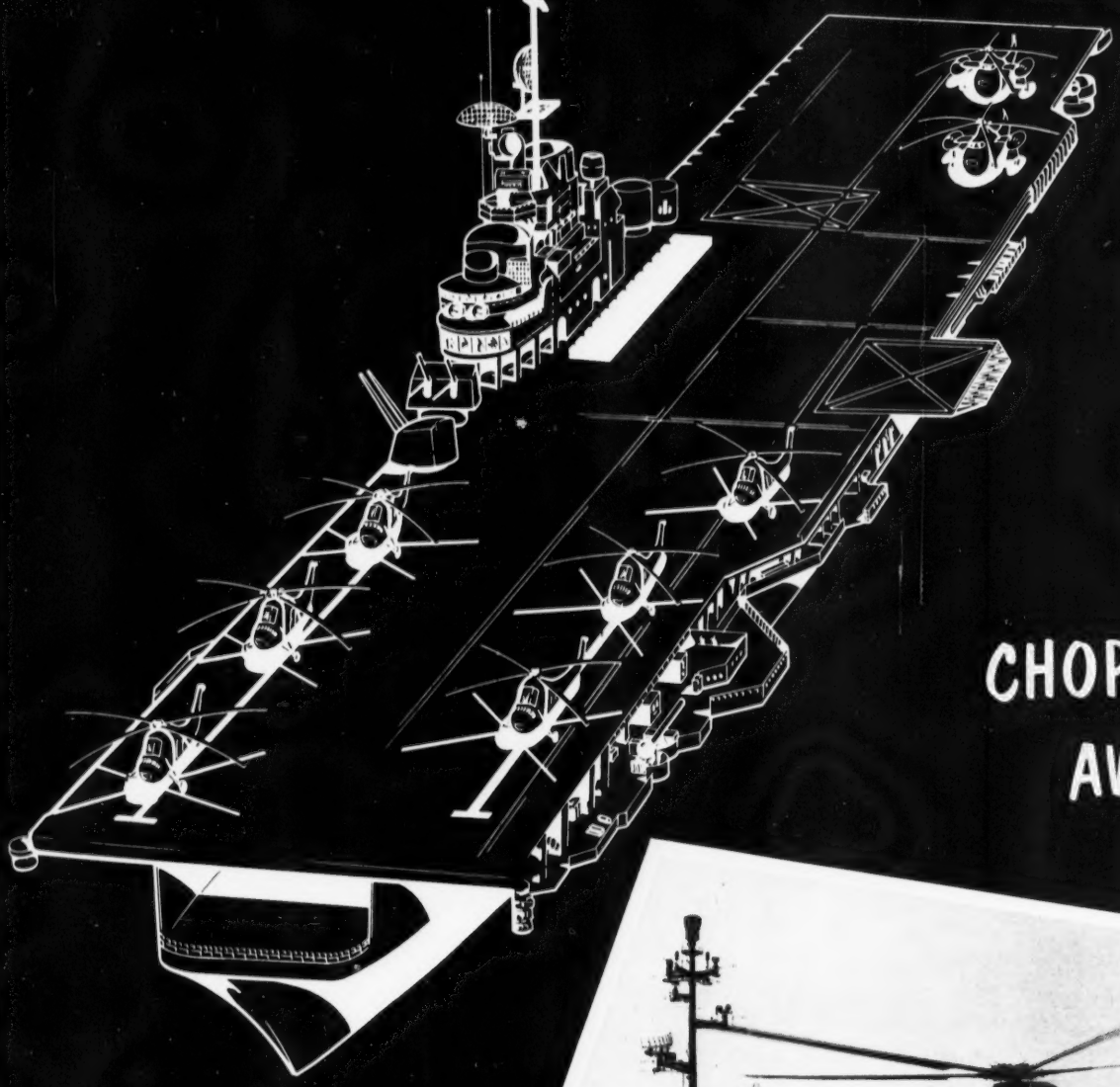
UNITED STATES ARMY AVIATION DIGEST

MARCH 1961

CHOPPERS AWEIGH



United States Army

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EDITORIAL STAFF
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FRED M. MONTGOMERY
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VOLUME 7
NUMBER 3

CHOPPERS AWEIGH, Lt Robert D. Stachel, Inf 1
YOU AND THE UR 7
NEW WING STOWAGE KITS FOR L-19 AIRCRAFT,
Lt Frank H. Hammond, III, Armor 10
A NONRATED INFANTRYMAN LOOKS AT ARMY AVIATION,
Col G. Harry Huppert, Inf. 12
HOW TO EARN $100 THE HARD WAY, Ed L. Dunnavant 16
TWX 18
INDUCTION SYSTEM ICE, John T. Neher 20
FLIGHT HAZARDS FROM ICING 21
STEAM FROM THE COFFEE CUPS, Lt Raleigh R. Meyer, Jr., Arty . 24
MEMO FROM FLIGHT SURGEON, Capt Robert L. Troske, MC . . 25
TRY IT DRY, Maj Pierce L. Wiggin, USAFRes 28
WHILE ON FIRM GROUND 30
CRASH SENSE 33
FORT LEE OFFERS AIRCRAFT REFUELING SEMINAR . . Inside Back
READY IN TRAINING AND EQUIPMENT . . . . . Back Cover

HEADQUARTERS THIRD UNITED STATES ARMY
OFFICE OF THE COMMANDING GENERAL
FORT MCPHERSON, GEORGIA

18 January 1961

SUBJECT: Institute of Aero-Space Science Award

TO: Commanding General
Fort Rucker, Alabama

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3. Every officer and soldier or other employee who contributed to the earning of this award has my sincerest commendation and deepest appreciation for his achievement.

Paul D. Adams

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Lieutenant General, USA
Commanding

U. S. ARMY AVIATION SCHOOL

Maj Gen Ernest F. Easterbrook
Commandant

Col Delk M. Oden
Assistant Commandant

Col Warren R. Williams, Jr.
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The printing of this publication has been approved by the Director of the Bureau of the Budget, 22 December 1958.

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Distribution:
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Lieutenant Robert D. Stachel, Inf

All facts, diagrams, and research for this article are based upon the draft Training Text 1-(), "Helicopter Operations from Helicopter Carriers," which has been submitted to U. S. Continental Army Command for approval.

Lt Stachel is a member of the General Support Platoon of the 101st Aviation Company.

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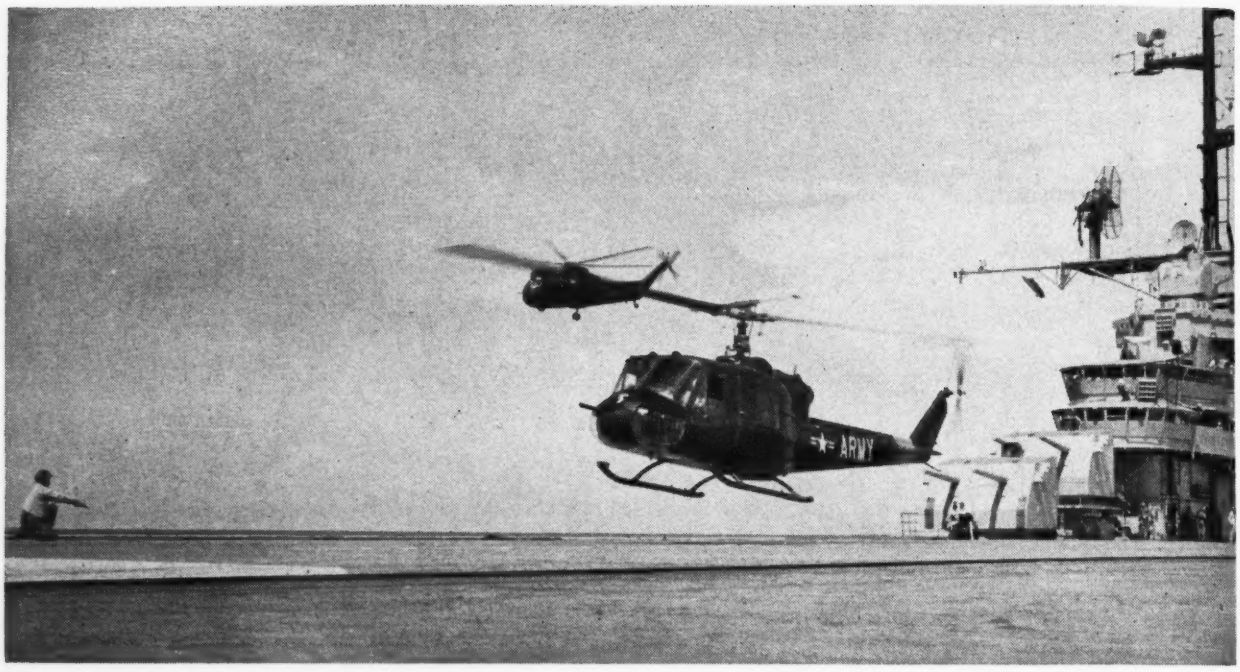


A task force commander's capabilities are increased with carrierborne choppers

ity is required to achieve surprise and simultaneously get a "toe-hold" on the beach.

The main drawback of an amphibious assault, as experienced in World War II's Normandy Invasion, Guadalcanal, and other amphibious assaults, was the relatively slow and costly build-up of a combat force on the beach, from a comparative handful of men to a sufficient force for striking inland.

Under enemy fire, counterattacks, and aerial bombardment, this build-up of strength and supplies took many hours and in some cases days to accomplish. As a result, these operations were more costly in human life than virtually any other type action in World War II.

The use of an airborne force in support of an amphibious operation is not new. The airborne divisions proved their worth during the European invasion. While much of their tactical unit integrity was lost after the drops, the shock action and the surprise element were achieved decisively. With the addition of helicopters to an amphibious operation, many possibilities for greater flexibility and mobility present themselves.

By using transport helicopters in an amphibious operation, the task force commander would have speed and flexibility significantly greater than water or ground transportation. He would also have the capability of fast shuttle-runs for more troops and equipment.

CLEAR TO LAUNCH . . . During ground training at Fort Bragg, N. C., an H-34 helicopter is cleared for launching from the simulated deck of a carrier during a signal practice session

Practice . . .

. . . makes perfect

In addition, the capability of the helicopter to take on and discharge troops and cargo from a hover in inaccessible areas eliminates the immediate need for a landing strip inland.

Further, the helicopter has proved safe at low altitudes. It can take advantage of the natural terrain and vegetation within the aggressor area to shield itself from view.

Lastly, the chopper can operate from all types of aircraft carriers, or from simple platforms on or alongside amphibious ships. It can operate under low ceiling and reduced visibility, and during times when the surf condition prohibits the use of landing craft.

However, the helicopter has definite limitations in such an operation.

A few of these limitations include vulnerability to small arms fire, reduced lifting capacity under high density altitude conditions, engine and rotor noise, dust blown up at a hover, and the need for accurate weight and balance computation.

With these capabilities and limitations in mind, let's look at a few of the missions to which the helicopter airmobile force might be assigned. Tactically, the airmobile force could attack the principal enemy position from the rear, flanks, or all three simultaneously. It could also isolate an enemy position by seizing key terrain.

Further, it is capable of diverting enemy attention from the main effort, exploiting a tactical success, transporting and picking up patrols deep in enemy territory, or giving added mobility to the reserve element or counterattacking forces.

The helicopters could be utilized administratively for aerial resupply, aeromedical evacuation, emergency wire laying and radio relay, evacuation of prisoners of war, and transport for liaison visits.

HELICOPTER CARRIERS

Normally, aircraft carriers used for helicopter ship-to-shore movement will be of the USS Essex class. This type of carrier has an 880-foot flight deck which can vary from 50 to 150 feet in width, depending upon whether it has the axial or angled flight deck.

Hangar space for 26 to 28 H-34 and 6 H-37 helicopters is provided in the second bay of the three-bay hangar deck.

The first bay is capable of holding from 1,500 to 1,800 troops if they utilize their air mattresses for sleeping. Permanent billeting space is inadequate. Cargo and supplies for the operation can be contained in Hangar Bay No. 3.

In addition to the troops, from 60 to 70 helicopter-transportable vehicles can be placed aft of the control "island" on the flight deck while en route to the objective area.

TRAINING FOR CARRIER OPERATIONS

Amphibious operations from helicopter carriers will require special training for Army Aviators, just as it does for Navy and Marine aviators. Naval communications, carrier traffic patterns, rendezvous, formation flight, and assault wave formations are but a few of the new techniques which must be perfected.

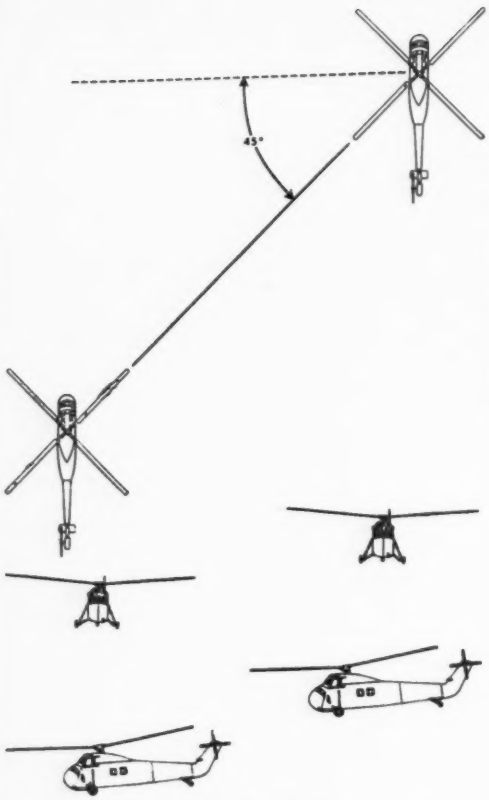


Fig. 1. Basic 2-plane section

The group of 32 Army Aviators, which were the first to become carrier qualified, trained for three weeks at Fort Bragg, N. C., in the formations, traffic patterns, and communication necessary for the actual qualification which took place during their fourth and final week of training.

Formations are similar to the standard Army aircraft formations, but there are some important differences. The basic tactical unit consists of the two-plane section with the leader normally designated as the No. 1 aircraft and the wingman as No. 2. The wingman may fly to either the left or right rear of the leader, depending upon his instructions (see fig. 1).

The three-plane section, used frequently by the Army, is rarely used in carrier operations for other than parade or administrative missions.

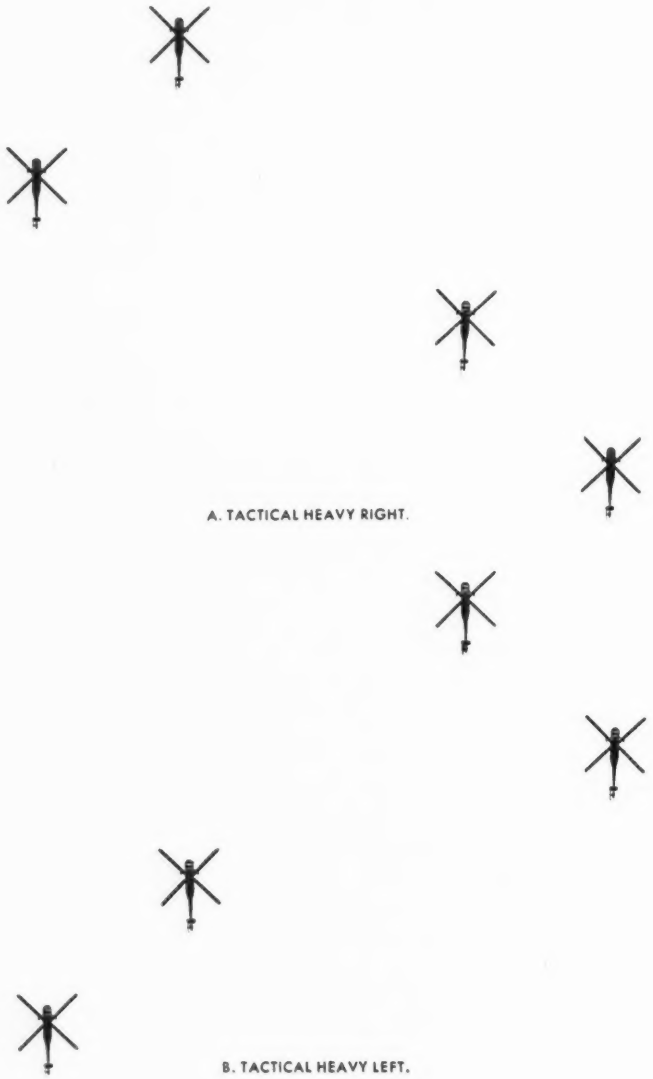
When two or more sections are together for a mission, they become a division. Naval experience has found that the two-section, four-plane division is the best tactical formation for control, flexibility, and operation from carriers.

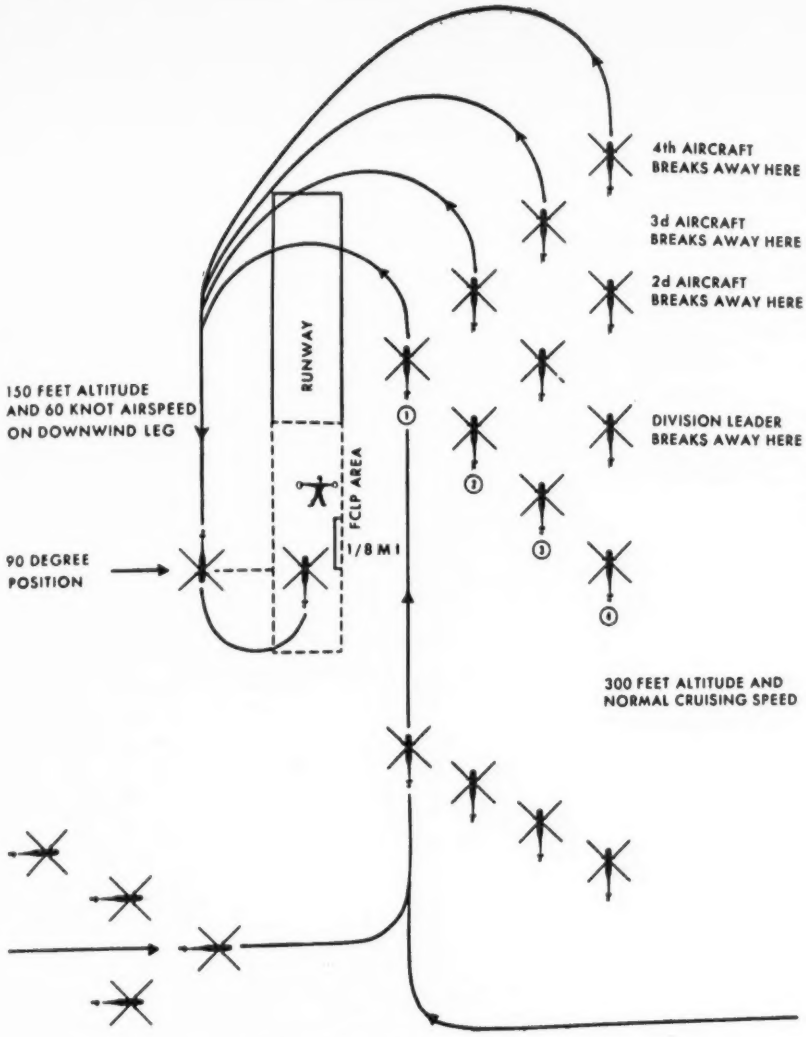
In this formation, the leader of the second section flies 30-35° to the rear of the division leader and opposite the side of the division leader's wingman.

The second section's spacing should be sufficient to allow the division leader's wingman freedom of movement to either echelon position. Figure 2a shows the second section on the right (heavy right) and figure 2b, the second section on the left (heavy left).

Another type of division is composed of two three-plane sections. Its formation is basi-

Fig. 2. Four-plane division formation




4th AIRCRAFT BREAKS AWAY HERE
3d AIRCRAFT BREAKS AWAY HERE
2d AIRCRAFT BREAKS AWAY HERE
DIVISION LEADER BREAKS AWAY HERE
150 FEET ALTITUDE AND 60 KNOT AIRSPEED ON DOWNWIND LEG
RUNWAY
FCLP AREA
1/8 MI
90 DEGREE POSITION
300 FEET ALTITUDE AND NORMAL CRUISING SPEED

Traffic pattern for FCLP (field carrier landing practice)

cally a column of vees, but, like the three-plane section, this division is rarely used except for parade or administrative missions.

For amphibious assault operations, the airmobile force uses the four-plane division almost exclusively. For example, if all 28 of the H-34s are flyable for the assault mission, seven divisions would make up the airmobile assault wave under the control of a wave leader.

Basically, all arm and hand signals for the formations and their subsequent inflight changes are the same as those used by the Army. The responsibilities of the division and section leaders are also the same to their aircraft and men.

LAUNCHING AND LANDING

Without going into extreme detail, it suffices to say that singular launching of the helicopters from the carrier is standard. The launch interval is from 10 to 30 seconds. After a division has been launched, the leader signals for a rendezvous of his aircraft.

Upon approaching the carrier for landing, the division leader will receive either a "Delta" signal, which means to begin a holding pattern off a specific quarter of the ship; or he will receive a "Charlie" signal, which indicates that he and his division will break up and enter the landing pattern.

The traffic pattern for carriers is more an elliptical "racetrack" pattern than the rectangular pattern flown by the Army. It is flown constantly to the left.

RENDEZVOUS PROCEDURE

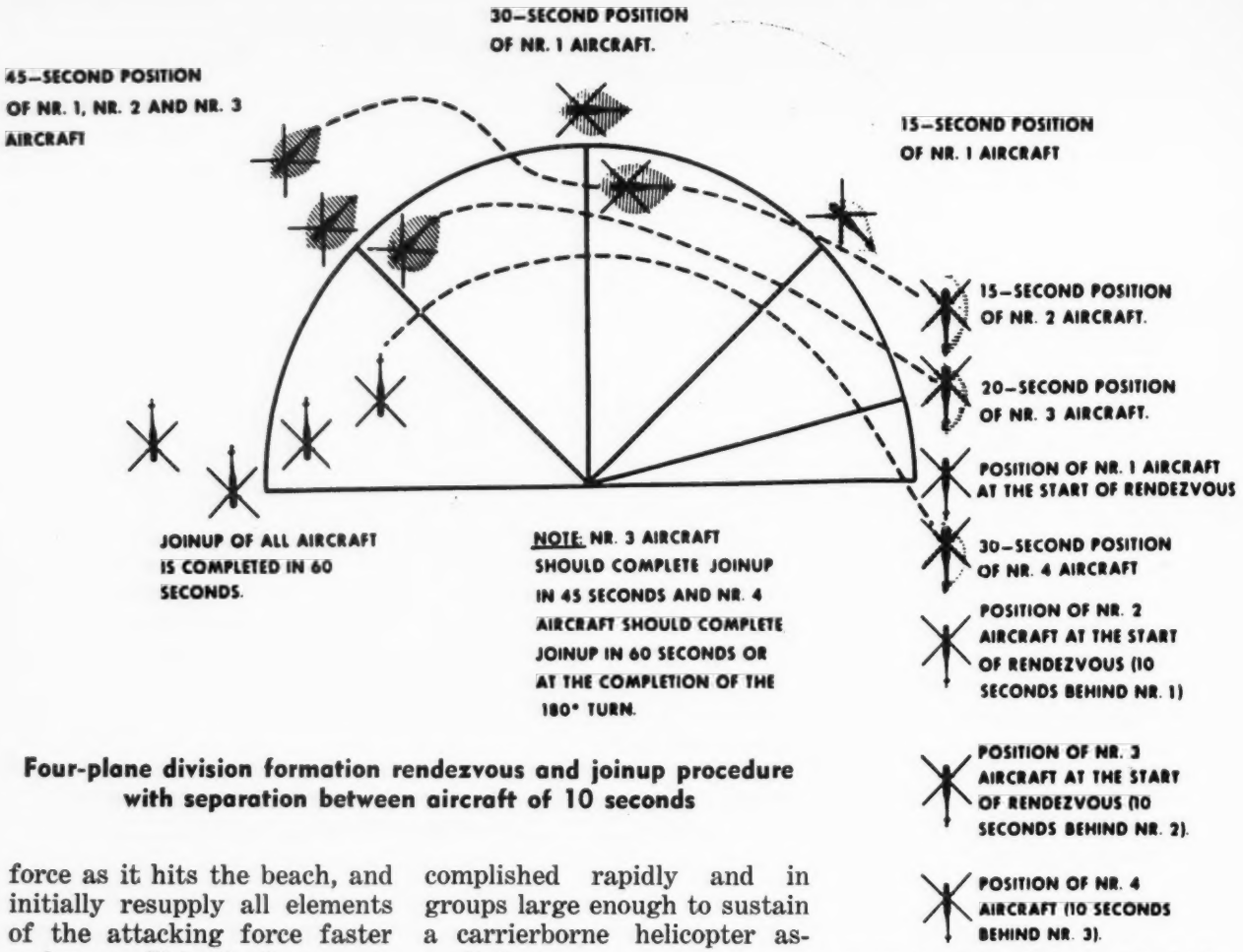
When the division leader desires to rendezvous his aircraft after leaving the carrier, he signals his wingman and the other aircraft in the trail formation by rocking his aircraft up and down along its longitudinal axis and then executing a 180° turn.

Each aircraft of the division continues its original course until the division leader approaches to approximately 45° to either side of it. Each, in sequence, begins a turn toward the leader. As a safety factor, the rate of closure is stopped at approximately 200 feet from the formation. Then the aircraft move into proper position.

Upon returning to the carrier from a mission, the division leader will signal for a carrier-type formation breakup. After placing his wingman in the echelon position opposite from the direction of his break, he signals for the breakup by rocking his aircraft from side to side.

He then executes a 90° to 180° turn away from his wingman. After waiting from 5 to 10 seconds, each aircraft, in turn, follows the aircraft in front of him. This time interval allows for 300-500 feet of spacing between aircraft, and provides the proper spacing for carrier landings.

In summary, an Army helicopter airmobile force could greatly relieve aggressor pressure on an amphibious assault


30–SECOND POSITION OF NR. 1 AIRCRAFT.
45–SECOND POSITION OF NR. 1, NR. 2 AND NR. 3 AIRCRAFT
15–SECOND POSITION OF NR. 1 AIRCRAFT
15–SECOND POSITION OF NR. 2 AIRCRAFT.
20–SECOND POSITION OF NR. 3 AIRCRAFT.
POSITION OF NR. 1 AIRCRAFT AT THE START OF RENDEZVOUS
30–SECOND POSITION OF NR. 4 AIRCRAFT
POSITION OF NR. 2 AIRCRAFT AT THE START OF RENDEZVOUS (10 SECONDS BEHIND NR. 1)
POSITION OF NR. 3 AIRCRAFT AT THE START OF RENDEZVOUS (10 SECONDS BEHIND NR. 2).
POSITION OF NR. 4 AIRCRAFT (10 SECONDS BEHIND NR. 3).
JOINUP OF ALL AIRCRAFT IS COMPLETED IN 60 SECONDS.
NOTE: NR. 3 AIRCRAFT SHOULD COMPLETE JOINUP IN 45 SECONDS AND NR. 4 AIRCRAFT SHOULD COMPLETE JOINUP IN 60 SECONDS OR AT THE COMPLETION OF THE 180° TURN.

Four-plane division formation rendezvous and joinup procedure with separation between aircraft of 10 seconds

force as it hits the beach, and initially resupply all elements of the attacking force faster and more efficiently than previous methods.

Training Army Aviators for carrier operations is not an easy task, but it can be accomplished rapidly and in groups large enough to sustain a carrierborne helicopter assault force.

In short, mobility, flexibility, and efficiency of resupply have become, since the invention of the A-bomb, keys to tactical success. By utilizing his helicopters in an amphibious assault, a task force commander has all three capabilities simultaneously at his disposal. □

Helicopters Fly IFR in Alaska

"ATC CLEARS Army Helicopter 62155 VFR to the Anchorage Low Frequency Range. Report over the Range for IFR clearance. Over."

A crew of four nosed the big red and white whirlybird into the gray, cold, snow-swept sky. Minutes later the crew acknowledged its IFR clearance and slipped into the misty white clouds.

With this clearance, instrument flight by Army helicopter became a reality in Alaska. The date: 10 Jan 1961.

The Army helicopters of the 80th Transportation Company, Fort Richardson, may now participate in the same "in the soup" flying that was once restricted to fixed wing and commercial aircraft.

From the military standpoint and within the limited capabilities of the present equipment, flights that heretofore had to be cancelled due to low ceilings or marginal weather conditions may be safely conducted under instrument conditions in accordance with the rules and regulations as provided by the FAA and Army regulations.

The responsibility for the safe, effective completion of any flight, VFR or IFR, rests with the pilot, who bases his decision on his trained ability. This is particularly true here in the far north where navigation facilities are limited, and the northern lights play "hob" with the radio.

The helicopter "gauge cagers" of the 80th have their work cut out for them. This is their beginning.

YOU and the UR

A DOOR SWINGS open in flight . . . the oil pressure gauge kicks up . . . an unexplained number of flameouts occur in a new aircraft . . . servo system failure causes forced landing. How many URs were submitted? Too few. Or none.

Shortly after takeoff from a Bolivian airport high in the Andes, the pilot of an L-23 experienced trouble and attempted a forced landing. The aircraft crashed and burned, with two passengers aboard. In the accident investigation it was revealed that the engine oil pressure gauge in the aircraft was not working properly . . . and had not been for some time. Yet no UR had been submitted.

The flight manual is very specific: in the L-23 the engine will be shut down within 30

Prepared by the U. S. Army Board for Aviation Accident Research.

seconds if the oil pressure is not up to operating minimums. Although the malfunctioning gauge is suspect in this accident, fatal to three, TMC in St. Louis had no word of the problem.

So the hard sell is on to pressure pilots to be more liberal in their use of the UR.

"So what's the point Mac?" growls the pilot to the maintenance man, "I submit a UR on this servo system, and what happens? I'll tell you what happens: nothing!"

If the maintenance officer had the time, was in the mood and in the know, he could explain a few facts of life to skeptical Sam. Every UR is heeded. Ideally TMC acknowledges them all with a postcard, at least, and immediate consideration is given the problem. Short staffs do cause backlogs, however, and delay.

The **Unsatisfactory Report Digest**, dated August 1960, a technical bulletin, is mighty thick proof that URs are not only acted upon but result in safer flying machines. The purpose of the bulletin as stated: "This technical bulletin is to disseminate to all Army Aviation field activities the results of investigations initiated because of unsatisfactory conditions reported on DD Form 1275." Clear enough? The pages contain actual case histories of action taken to correct malfunctions, handbook instructions, or techniques.

As vital as the UR has proven to be to the future of top operational Army aircraft, still too few are submitted, and the ones written up are often inadequate. Often too, the request for follow-up information is not forthcoming or is too slow to be of real aid.

The modification of an aircraft to rid it of unsafe flight characteristics is one of the most concrete steps that can be taken in this business of accident prevention.

AR 700-41 clearly states the case for submitting URs and spells out the persons responsible for doing so:

"The importance of accurate preparation and prompt submission of this report cannot be overemphasized, as unsatisfactory conditions frequently affect safety of flight as well as the efficient accomplishment of assigned missions."

A great deal of misinformation is abroad as to who can or should submit a UR. Often it is considered to be only within the maintenance province but this is not so. Second paragraph of the AR 700-41 says: "An individual detecting an unsatisfactory condition is responsible for submission of a complete report on that deficiency. Reports will be submitted by military personnel, civilians employed by the Army or persons in any way connected with equipment or material involved, either under contract or otherwise."

BE MORE SPECIFIC

"But just what good do these URs do? Be more specific," storms the impatient pilot in the field, faced with a suspect plane, miles from headquarters, and who feels that paperwork upon paperwork is just for the burning.

Following four crash facts messages indicating accidents caused by faulty primers on the L-19, USABAAR submitted a UR and the primer was modified to prevent flooding the engine when the auxiliary fuel pump was in operation.

On the justification of 19 URs, the exhaust valve on the L-23 was improved. Following an engineering change proposal study, needled by 14 URs, the materials for the tappet body and plunger assembly were also strengthened on the 23.

These might be considered examples of the plus side of the picture but what about the minus?

It takes concrete criticism, not hearsay, to spark engineering changes in airplanes. Here is the rub. A recent report sent to USABAAR from TMC points up the delay that arises from contradictory URs, misleading URs, or no URs at all. Often they say, it is necessary to contact the reporting activity and request additional information or clarification. You lose valuable time here.

WINDOWS POP OUT

A few cases involving the H-34 point up the confusion that exists. Several crash facts messages were received citing loss of cockpit sliding windows in flight. In addition to this, one activity reported by telephone that four more sliding windows fell out while the aircraft were still on the ground. It was stated by phone that in each of these instances the corrective modification instructions in the tech manuals had been compiled with. This is important, for the TM had been changed to prevent this trouble.

As of the last report, two formal URs had been received. Messages from headquarters to outfits requesting URs and photos on window failures have not been acknowledged. Furthermore the two URs that were received stated that the helicopters were returned to

service **after** compliance with the change in the manual. So confusion is compounded.

But such incidents continue. A crash facts message was received a year ago citing clamshell door damage on the H-34. It was reported that the clamshell doors opened in flight and were bent beyond repair. The cause was attributed to a door latch malfunction. However, no additional information has yet been received by the authorities to rule out either maintenance error or materiel failure. So once again a possible fix is left hanging fire because URs were not submitted from the field or from units flying these aircraft regularly enough to detect recurring trouble.

A crash facts message was received citing failure of a hose in the primary servo system which resulted in a forced landing, but no UR was forthcoming. An inflight engine failure was reported; when TMC requested pertinent questions be answered to determine the cause of the failure, no further information was sent.

These are but a few samples of the abuse of AR 700-41 that states URs will be submitted reporting materiel deficiency.

WHEN? WHAT? WHERE?

Now for the URs that are turned in. Unless they are complete, detailed, and factual they are of little value. It is imperative to the people studying engineer change proposals that they be furnished all the facts available in strict accordance with the applicable AR. Any delay encountered while processing these reports is magnified when bits and pieces of the information needed for proper evaluation are missing.

And bits and pieces are continually being left out. What in particular? Usually the description fails to give everything needed in fullest detail. Often missing are the serial number of the part and the time on the component so that fatigue factors can be considered. Too often the manufacturer's name is missing, or the last overhaul agency is not listed. Of course, many other items can be skipped, making the work of the people attempting to get at the heart of the matter well-nigh impossible.

In filling out DD 1275 the most important section is still the description of how, why, when, and where the part failed or was suspected of malfunction. The cause should be speculated upon; the action taken listed; any recommendations pertinent should be made; disposition of the part given; and finally, any remarks that will throw light on the subject should be listed.

FLAMEOUTS

A hard sell for the proper UR is vital when new aircraft are being introduced into the system. Rumor of bad performance only inflames the problem and does nothing to correct an already uneasy situation.

By word of mouth, pilots heard that flameouts were occurring in the HU-1A. A thorough inquiry was made and it was learned that nearly 100 flameouts — many on start — had been experienced in the HU-1A, but less than a dozen URs had been submitted. The pilots didn't consider it important, but the Lycoming people, who are re-studying their system, do.

With the Mohawk and Caribou due to arrive at commands around the world soon, every effort should be made to keep track of their flying characteristics, so that techniques of flying can be properly taught and engineering changes made when necessary.

By mid-1962, the Army should have the HU-1B and D models, as well as the Chinook to fly. So aviation commands, with special attention to field units, will be asked to keep a close watch on performance.

It is the operational performance that is the payoff in any Army aircraft. □

Are You Being Shortchanged?

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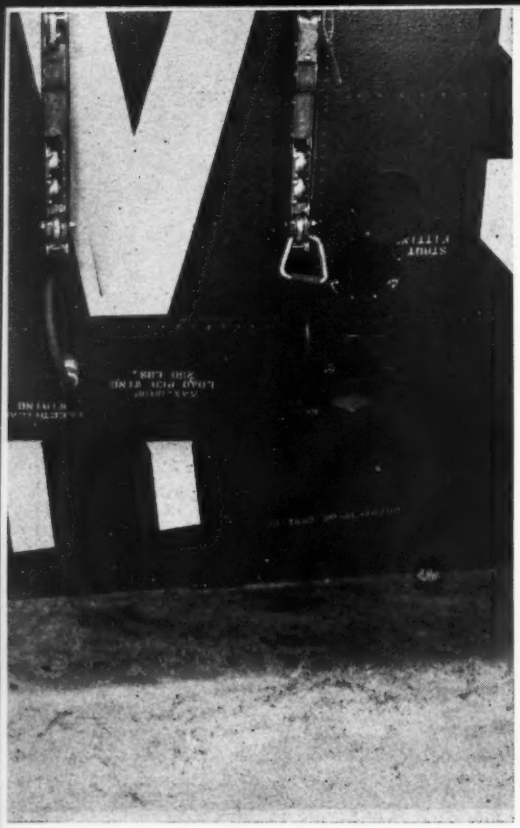
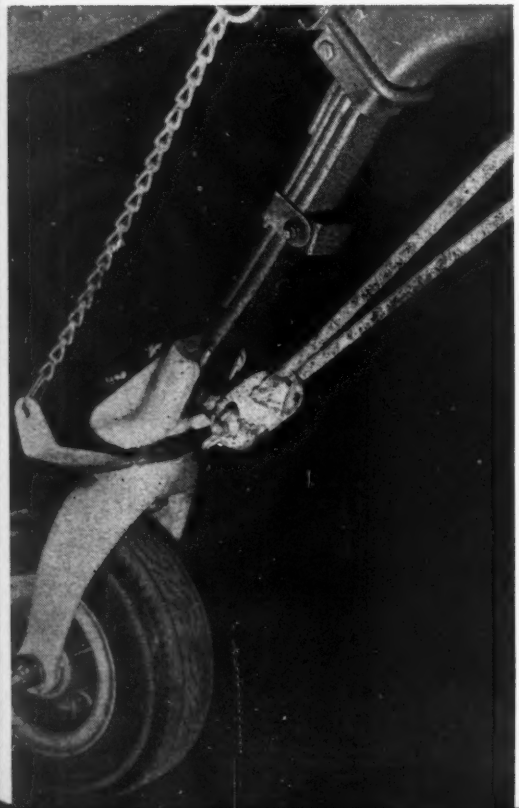
New Wing Stowage K

Lieutenant Frank H. Hammond, III, Armor



Straps passed under fuselage and fastened to bomb shackles of each wing prevent vertical wing movement in transit. View below shows tailwheel tiedown assembly.



A NEW METHOD of loading L-19s for transporting by Air Force carriers has been developed by the 82d Avn Bn at Fort Bragg, N. C. Previously, loading these aircraft consisted of removing the wings and placing them in bulky crates. For greater ease in handling and speed, a new method was devised. This entails fastening the wings to the side of the fuselage by use of supports attached at the lift handles and rear float attaching station. These supports are called "wing stowage kits."

These kits were fabricated by the Post Ordnance Shops. Total cost for 10 kits, including labor, was $660. The materials used were #10 gauge sheet steel, 3/8" brass rod, matted felt, and minor steel members for bracing.

The average total time for readying the aircraft for loading is 4 hours; the majority of this time is consumed by the removal of the wings. Only a few minutes are required to attach the kit to the fuselage. Another 4 hours' time is required for flight readiness after shipment, with again the wings consuming the majority of this time.

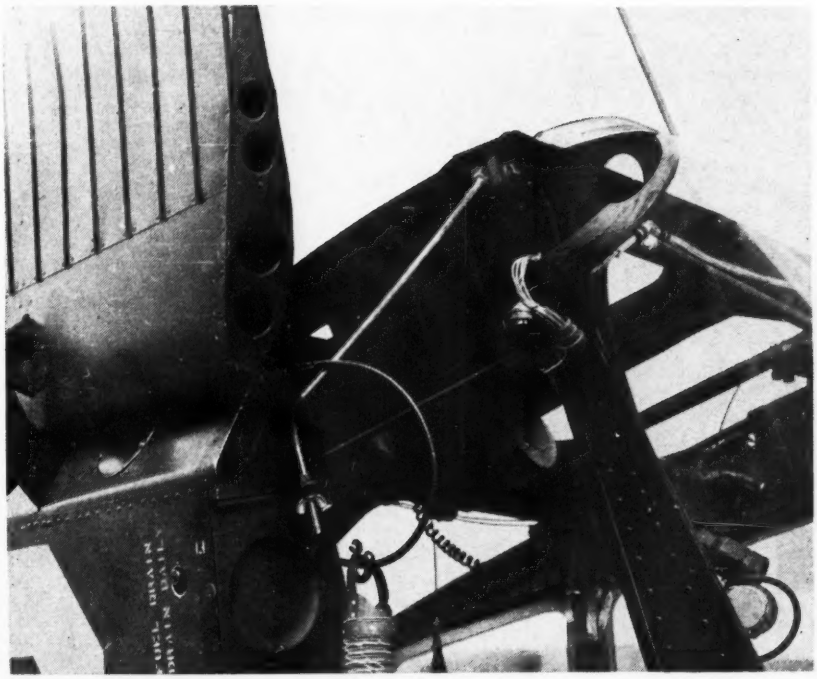
Compare this with the crate method where each wing and the fuselage require separate crating. Uncrating and assembly require more time due to the bulkiness and weight involved. Up to two days are spent in shipment readiness.

Once the aircraft has been made ready, movement is easily done by normal ground procedures. The brakes are locked once inside the transport by sliding the right side wing to the rear in order to open the door, then replacing the wing in its fastened position. Since the C-124 (so far, the only Air Force carrier used) has a divided loading ramp, lifting and pushing are required for transport loading. The C-130 has a flat ramp and would require no lifting.

Only static trials have been made with the metal kits. However, very similar models made of reinforced plywood were successfully used in a trial flight by C-124 last fall from Pope AFB to Camp McCall, N. C. A

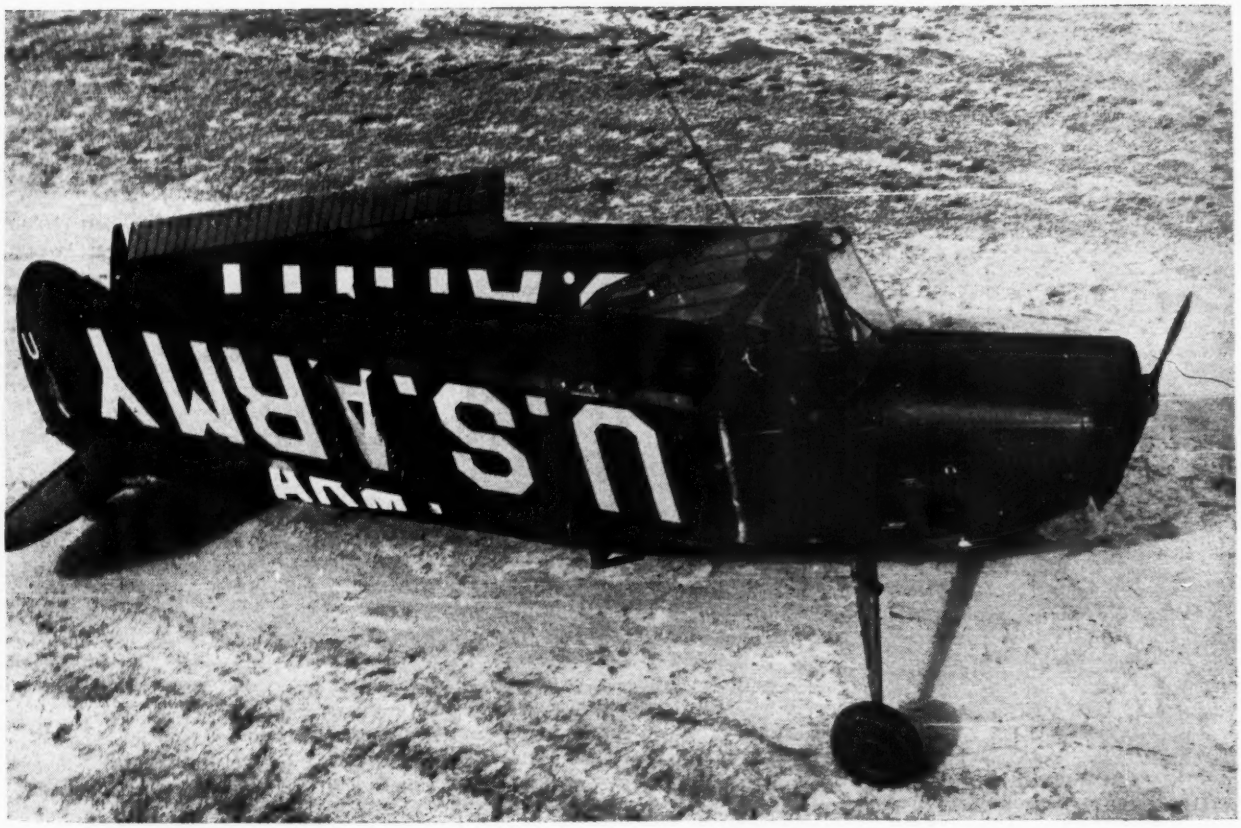
Lieutenant Hammond was project officer for testing this new loading method. He is with the 82d Avn Co (Abn Div), Fort Bragg, N. C.

ageKits for L-19 Aircraft



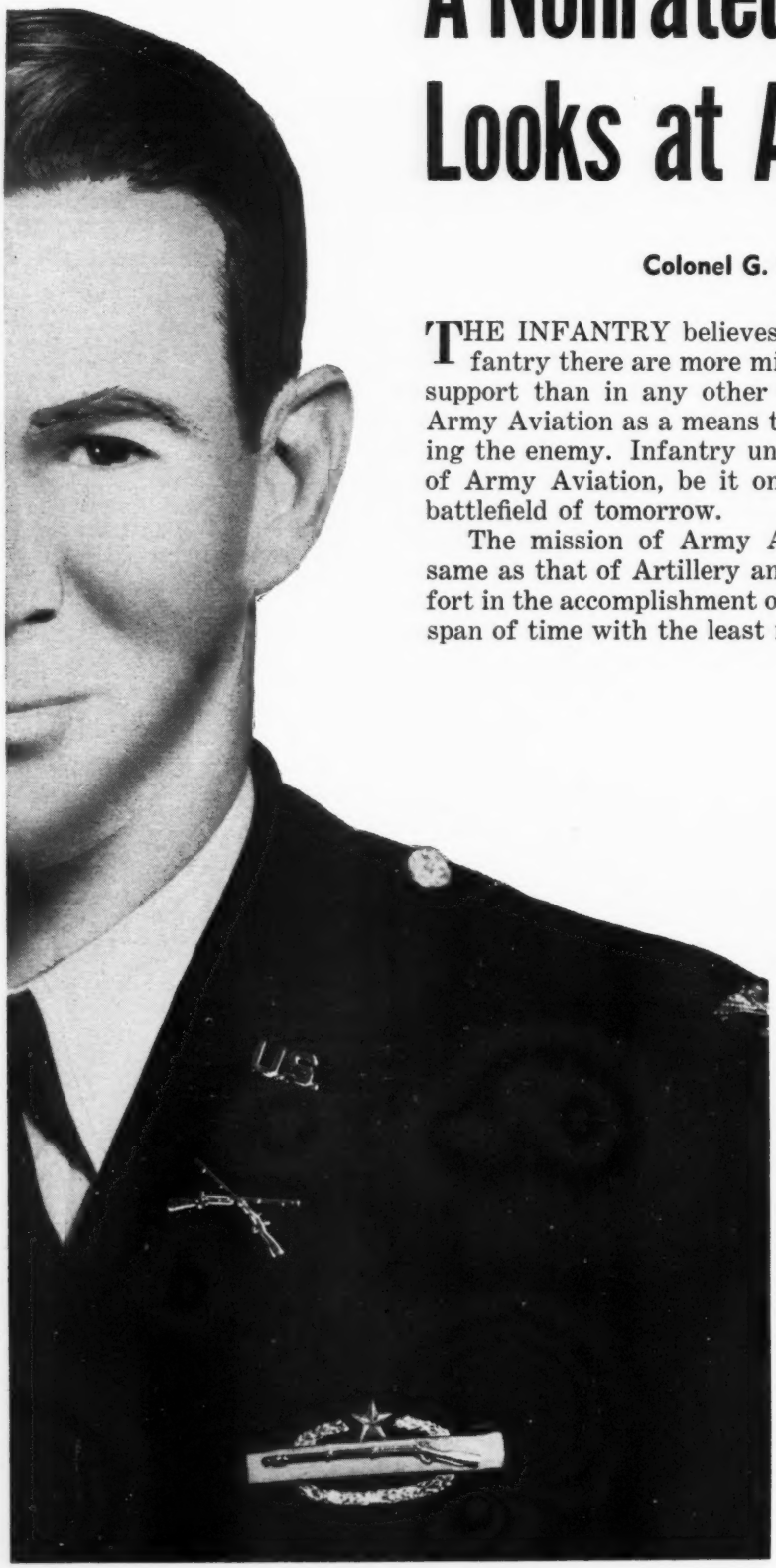
planned move to Alaska this winter involving 82d Airborne Division elements will include air transporting an L-19 by this method. □

Right: close-up view of wing-stowage arrangement near cockpit. Bottom: overall view.



A Nonrated Infantryman Looks at Army Aviation

Colonel G. Harry Huppert, Inf



THE INFANTRY believes in Army Aviation. Within the Infantry there are more missions which require Army Aviation support than in any other branch. The infantryman looks to Army Aviation as a means to the end: closing with and destroying the enemy. Infantry units will be one of the greatest users of Army Aviation, be it on the training field of today or the battlefield of tomorrow.

The mission of Army Aviation to the infantryman is the same as that of Artillery and Armor: to support the ground effort in the accomplishment of the assigned mission in the shortest span of time with the least number of casualties. To accomplish this mission, sufficient aircraft of the proper types must be available within the infantry division and the battle group. The aircraft organic to the battle group must be capable of living with the infantryman and of performing the many varied missions which will be generated. Mission versatility, flexibility, and responsiveness to the ground commander were fundamental principles upon which Army Aviation was organized. These principles are still valid and must be the guideposts for future Army Aviation developmental concepts.

We, the Infantry, believe that the roles of Army Aviation, in support of the battle group, are encompassed in the following general functions:

Colonel Huppert is assigned to the Combat Developments Office, Fort Benning, Ga. The opinions expressed in this article do not necessarily reflect those of the U. S. Army Infantry School.

- Limited tactical troop lift capability, including airmobile operations.
- Airborne fire support.
- Reconnaissance, surveillance, and target acquisition (RESTA).
- Command, control, and liaison.
- Resupply and medical evacuation.

From the Infantry point of view, the majority of Army Aviation effort in support of the battle group is within or over that area for which the battle group is responsible. Movement of troops, supplies, equipment, liaison officers, staff officers, and commanders will absorb the majority of the sorties flown. The remaining flights will be those airborne RESTA and fire support missions which can be accomplished from positions above, just forward of, or to the rear of friendly elements, and specific airmobile-type operations.

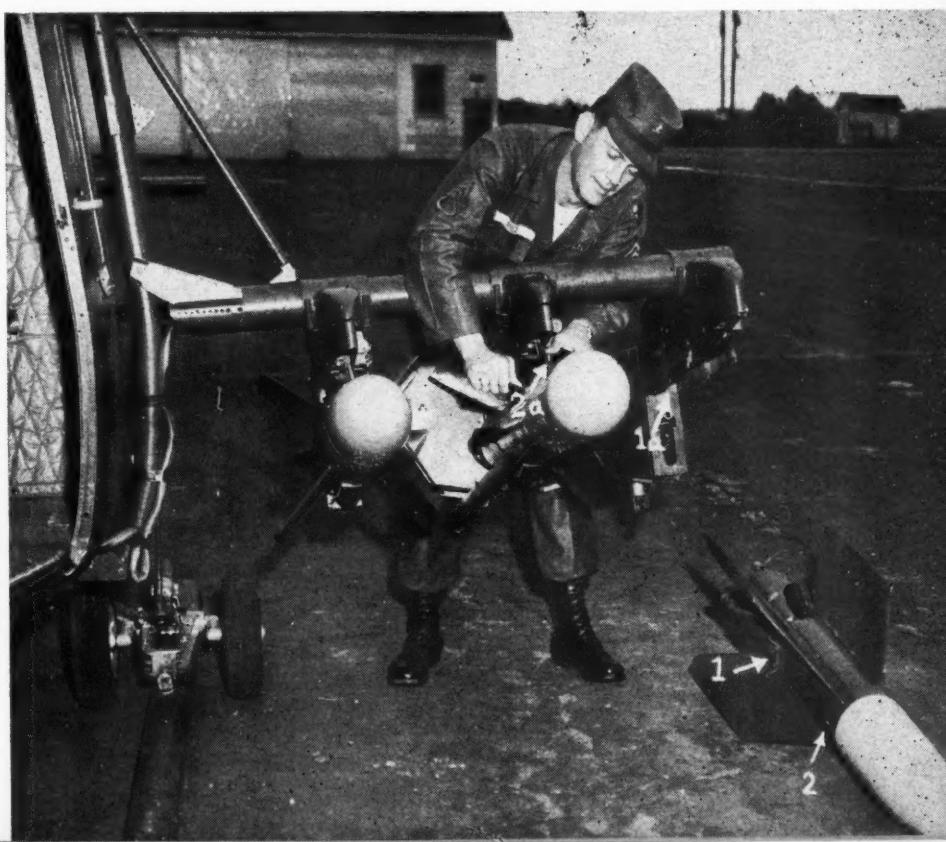
The Infantry has been a proponent of airmobile operations for a long time. Many of the tactics, techniques, and procedures pertaining to airmobile operations have been developed at the Infantry School, in coordination with the Aviation School. Even though "nap-of-the-earth" flight techniques will be utilized to substantially reduce aircraft vulnerability, airmobile operations will require simple but detailed planning. Proper flight routes must be selected by detailed map, ground, and aerial reconnaissance. Preplanned suppressive fires of artillery, tactical air, and Army aircraft are required to ensure that losses will be held to the minimum. Additionally, detailed tactical plans for a rapid ground link-up must be developed to ensure the successful execution of most airmobile operations.

Fire support is essential to infantry operations. Army Aviation can be a valuable adjunct to increasing this fire support. Army aircraft of the battle group, and within the infantry division, must have the capability of rapidly mounting quick attach/detach weapons kits for use in an airborne fire support role. These airborne fire support functions can best be accomplished in repelling enemy attacking elements, when supporting friendly counterattacks, or when the aircraft assisting the assault echelons are operating over forward moving friendly troops. Also, fire support can be effectively accomplished from over our own lines against the enemy by use of a "stand off" delivery capability. The Infantry believes that very rarely will current or future Army aircraft of the relatively slow flying type be capable of operating over enemy territory to seek out targets of opportunity. We would like to see this, but it is doubtful that any modern enemy force would permit such operations.

The battle group aircraft, the light observation helicopter (LOH), must have the capability to effectively accomplish fire support missions. In addition to performing this important mission, the LOH also must be capable of performing other battle group aviation missions.

SS-11 for HU-1A is a quick attach/detach weapon

Hook (1) slides down track (1A); clamp (2A) engages rocket in groove (2) to support missile. SS-11 weighs 63 pounds. Under ideal conditions one experienced man can attach one rocket to the launcher in about 1 minute, but two experienced men are usually used and mount the six rockets in about 2 minutes.



NATO M-60 machinegun can be attached or removed in a few seconds. Pins (1 and 2) are inserted on the inboard side of the mount adaptor and protrude at points A and B.

Close air support for infantry units is necessary. Currently, other Services are charged with this mission under Department of Defense Roles and Mission Agreements. The projected availability of this support is questionable. If plans are not being made by other Services to satisfactorily accomplish this mission, then the Army must initiate urgent action to permit the development and procurement of suitable Army aircraft for use in the air-to-air and air-to-ground close support roles.

One of the most valuable missions Army Aviation can perform for the Infantry is that of reconnaissance, surveillance, and target acquisition (RESTA). To supplement the close-range ground surveillance devices of the battle group, Army aircraft, using nap-of-the-earth flight techniques and pop-up tactics, can acquire information required by the commander and can secure additional enemy targets for infantry weapons.

The future battlefield is envisioned as being characterized by fluid operations of units dispersed under the threat, or actual use, of tactical nuclear weapons. Dispersed infantry units will mass rapidly and momentarily to exert the maximum combat power and then, just as rapidly, disperse. A tactical troop lift capability by Army Aviation will permit the commander to realize optimum mobility in these fast moving situations. At the same time, the commander, through the use of an Army aircraft, will be able to move rapidly over the battle area and place himself where he may best influence the actions of his unit.

Many Combat Development agencies contend that on the dispersed battlefield primary reliance will be placed on radio as a means of communication. Again, Army aircraft acting as an airborne station may be required to relay transmissions to more distant units. Or, if the threat of enemy electronic interception is great, Army Aviation may quickly transport liaison officers from one unit to another, transmitting the decisions and future plans of the commander. [See **Flying Command Post,** AVIATION DIGEST, Nov 1960. ED.]

These are the tactical concepts and aviation support requirements of the Infantry. Now, what type of aircraft must we have to accomplish our mission? An analysis of current and developmental aircraft indicates that the pure VTOL aircraft is the only one capable of performing infantry missions. As aviation technology progresses, it may be possible to combine the advantages

HU-1A demonstrates pop-up tactics

of the VTOL/STOL aircraft and produce a new and revolutionary type. However, within the foreseeable future a simple to operate and maintain VTOL aircraft appears to be the best answer.

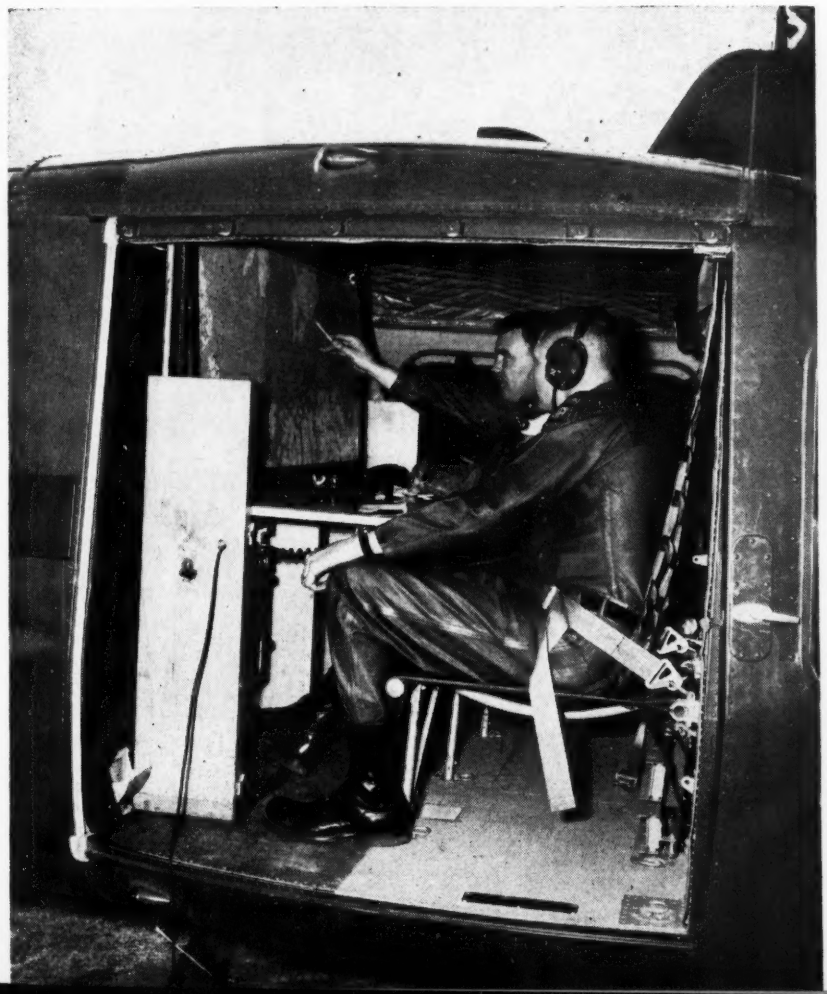
This aircraft must be inexpensive to permit purchase in large quantities; yet, rugged enough to stand the battlefield environment and operate day and night with minimum maintenance. Small caliber projectile and fragmentation vulnerability must be minimized. It must be capable of operating at treetop level and among the hills and valleys of the battle group area. Dual flight controls and complex electronic navigational equipment will not be required. A minimum number of simple flight controls will be required to permit both day and night flight operation under marginal weather conditions. A small IFF (Identification Friend or Foe) transponder will be required to assist in air traffic identification.

The Infantry aviators, both officer and enlisted, who fly these aircraft must be professionally well qualified and trained to operate day and night under marginal weather conditions in support of the battle group effort. At the present time, approximately 8.5 percent of the officer strength of the infantry division are aviators. The austere nature of the Army manpower situation cannot afford this specialized utilization of critically needed leaders, especially upon mobilization. Therefore, some enlisted pilots are required. Army Aviation at the battle group level cannot be complex; it must be simple and reliable.

The level of assignment and organization of Army Aviation within the battle group poses a difficult problem. It may be desirable to integrate Army aircraft into many of the subordinate units of the battle group. However, this might tend to fragment the overall aviation support of the battle group. Normally, the Infantry does not favor the formation of specialized-type units. However, it must be remembered that when DAVY CROCKETT was placed in the battle group, we organized a DAVY CROCKETT platoon. When mortars and recoilless rifles were introduced into the Infantry we organized platoons of these weapons. Logically, it then follows that a requirement does exist for an organic aviation platoon in the battle group. We cannot continually express urgent requirements for Army Aviation in the battle group and at the same time deny the commander the capability to control and support the operation of his aircraft . Additional personnel spaces and equipment must be procured to permit the formation of a battle group aviation platoon.

We, the Infantry, believe in Army Aviation. Army Aviation is essential to the battle group in the accomplishment of its ground mission. If the planners involved in the future of Army Aviation can develop the aircraft and tactics to give us the support we require, the infantryman's mission of closing with and destroying the enemy will become a little less difficult to accomplish. □

HU-1A mobile command post, 82d Abn Div



how to earn the HARD WAY

Ed L. Dunnavant

IN FEBRUARY, 1946 a businessman from Elmira, N. Y., had been grounded at Knoxville, Tenn., for two days because of weather. He was flying a 1941 Taylorcraft en route to Texas. I was employed by a fixed base operator as a flight instructor and paid for each hour of flight instruction given. The flying wasn't too good during the winter months, and the short days didn't help.

This gentleman from Elmira approached me with an offer of a crisp $100 bill to fly his T-craft to Elmira when the weather lifted. I hadn't been off the ground in nearly a week, and that C-note plus expenses looked mighty good. So I agreed, and he boarded an American Airliner for his Texas destination.

About 0900 on the following morning the ceiling lifted to 1,000 feet. I took off for Elmira with the first fuel stop scheduled for Huntington, W. Va. As I approached the Cumberland Mountains, their tops were still hidden in the clouds. Instead of making a 180° turn for Knoxville, I made my first mistake: I found a low place in the ridge of mountains and continued the trip. With only a map and a compass for navigation, it was very difficult to maintain orientation while changing headings to keep clear of clouds and mountains. I thought I was following the right railroad track, but it turned out to be a coal mine spur track which disappeared into the side of the mountain. Thank goodness the good Lord made the valley wide enough for me to make a 180. The map didn't show all the coal mine spur tracks, and by this time I decided I was disoriented — in short, lost.

While flying over another ridge and into another valley, I made another mistake. Instead of flying south out of the mountains and returning to Knoxville, I decided to find a suitable farmer's field to get some directions. I failed to realize the risk of damaging the aircraft. I didn't call it a high and low recon then, but they were made and a successful landing accomplished. The farmer obliged by coming over to the plane and "set me straight" on my orientation.

The ceiling was higher now and I thought all my troubles were over. After about 50 miles, I was flying in cloudless sky behind a cold front. Now it was turbulence — and over the eastern Kentucky mountains it can be quite severe. The little T-craft and I tried every alti-

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Mr. Dunnavant is a civilian flight instructor with the Advanced Contact Division, Dept of Advanced F/W Training, USAAVNS, Fort Rucker, Ala. He is fixed wing rated and instrument qualified, with over 10,000 flight hours.

tude up to 9,000 feet; it was all the same: extremely rough! On one occasion my safety belt wasn't tight enough and my head made a hole in the fabric roof of the cabin.

Huntington's airport on the Ohio River had only one usable runway at that time. The wind was real strong, 90° crossed, and quite gusty. Thank goodness for power approaches and wheel landings. No other way would have gotten the T-craft on the ground. After refueling and eating a sandwich, I had another decision to make. Should I take off again and fight that wind and turbulence, or remain overnight and hope for a better day tomorrow? The taking off decision won; and the leg to Bettis Airport in Pittsburgh was made without incident. The turbulence diminished as we neared our destination for the night.

When I took off the next morning ground visibility was a bare 3 miles; and flight visibility wasn't much over 1 mile — the restriction: Pittsburgh smoke. After using dead reckoning navigation for about 30 miles, I picked up the map for pilotage. A very light (1-inch) snow had fallen a couple days before, leaving the Pittsburgh area white.

The T-craft needed fuel in the vicinity of DuBois, Pa. The chart showed DuBois Airport had a sod landing area, and it appeared to be an all direction landing airport. An approach was made into the wind; as the touchdown was made I suddenly realized the snow wasn't 1-inch deep as in Pittsburgh, but about 18 inches instead. The landing roll was about 3 feet and the aircraft went on its nose, stopping the prop horizontally in the snow. After stepping out in the knee-deep snow, I pulled the tail down and examined the prop for possible damage. The snow was so soft and deep there was no damage to the prop or the cowl underneath the engine.

Because of the deep snow and the zero degree wind, the walk to the hangar seemed about ten times farther. No one was at the hangar, which housed a half dozen light planes equipped with skis. I telephoned the airport operator and he agreed to come out and help me to the gas pump. He pushed while I attempted to taxi, but we only managed to move the aircraft about a couple of feet. After scratching his head, he said there was only one dual wheel truck with chains in DuBois which could pull the T-craft through the deep snow to the gas pump. The problem was that it was owned by an undertaker and he was having a funeral that afternoon.

When we arrived at the cemetery the family and friends were leaving, and the dirt was being shoveled in the grave. In order to get the big truck to the airport as soon as possible, I grabbed a shovel and helped fill the grave. Sundown was early; and it was still a long distance to Elmira, N. Y., for a 65-horsepower T-craft.

The big truck with chains dragged the little T-craft through the deep snow to the gas pump. The operator showed me a section to make my takeoff where the snow was only about 2 inches deep, as it had been previously cleared for takeoffs and landings. Now I made another mistake. In my anxiety to reach Elmira, I failed to figure my elapse time and the time of official sundown. The T-craft was strictly a daytime flying machine. But I took off on my last leg across those western Pennsylvania mountains. In the days of the pilots who "flew the mail," this section was called the "Pilots' Graveyard" because so many had fatal accidents in this area. In mountainous, snow - covered country, it is rather difficult to navigate with only a map—especially when the railroads and other terrain features are covered with snow.

As it started to get dark, I still had about 60 miles to go. There was a CAA auxiliary field just below, but I knew the snow was deep here, too; I didn't relish spending the night in that subzero weather. No navigation lights! No instrument lights! No flashlight! There was a little dry cell operated radio receiver in the aircraft which had a range of about 40 miles. Before it got too dark to read the map, I noticed the frequency of the Elmira low freq range and my course was parallel to the southwest leg. On my first attempt I could not receive a signal, but about 10 minutes later I received a faint "on course." That was really music to my ears and a short while later I picked up the rotating beacon, which was really a sight for sore eyes. Then I began to wonder about the snow on the Elmira runways. But the runways had been cleared and an uneventful and happy landing was made.

A pilot can read a lot of "do's and don'ts," but lessons learned the hard way by bitter experience are certainly more lasting. While helping push the T-craft into the hangar, I thought to myself, "That was a hard way to earn a $100." □

THE
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TWX excerp

L-20A SLID OFF icy runway onto adjacent taxiway and struck snowbank. Right gear sheared. Forward bulkhead damaged. Propeller bent. No injuries.

L-19A LOST OIL PRESSURE in flight and engine began running rough. Pilot reported smelling hot oil. Pilot and passenger bailed out of aircraft. Pilot killed. Passenger not injured. Aircraft destroyed. Cause of lost oil pressure unknown pending investigation.

H-21C ENTERED FOG at flight altitude while flying around a bend within a mountain pass. Pilot completed turn and attempted to land on the edge of a lake which appeared frozen. Aircraft settled on ice, broke through, and rolled to its side. Major damage. No injuries.

H-21C ENGINE FAILED in flight. Aircraft struck earth dike at termination of autorotation, rolled approximately 80 feet and settled to its left side. Major damage to fore and aft rotor heads and rotor blades, vertical and horizontal stabilizers, and landing gear. No injuries. Cause of engine failure undetermined pending investigation.

L-19E STRUCK TREE during go-around from tactical strip. Incident damage to right wing. No injuries.

H-21C STRUCK EXTERNAL LOAD while descending for hookup. Fuselage bottom punctured. No injuries.

H-23B ENGINE FAILED in flight due to fuel starvation. Aircraft was autorotated into city street. Main rotor struck tree and aircraft landed extremely hard. Pilot suffered compression fracture of lumbar vertebra and face abrasion. Aircraft destroyed.

HU-1A OIL PRESSURE DROPPED below red line in flight. Aircraft was autorotated into large field between two mountains and landed with no damage. Overboard engine oil drain line found broken at flange near T fitting at oil cooler. Cause undetermined.

H-19D TAXIED TOO CLOSE to parked aircraft. Aircraft was taxiing to tiedown area. Main rotor contacted tail rotor of parked aircraft, causing incident damage. Estimated damage: $2,000.

H-21C ENGINE FAILED in flight. Aircraft was autorotated to landing with no damage. Cause of engine failure undetermined pending analysis.

H-21C SETTLED WITH POWER during approach to pinnacle pad. Major damage to landing gear. No injuries.

H-34 LIFTED OFF when pilot climbed into cockpit from passenger compartment. Engine was running and rotor blade was engaged. Pilot's clothing caught pitch stick, causing aircraft to lift off. Aircraft struck the ground in a 3-point attitude and broke tailwheel and yoke. No injuries.

H-13H TAIL ROTOR STRUCK DIRT RIDGE of tank track during downslope landing. Incident damage to tail rotor blade. No injuries.

L-19A STALLED at low altitude and crashed in dive. Pilot killed and aircraft destroyed.

H-34C LANDED with brakes locked at termination of practice autorotation. Aircraft nosed over, damaging clamshell doors, engine shroud, and engine tachometer generator.

L-19A TAXIED INTO ANOTHER AIRCRAFT while parking. Incident damage to left wing. No injuries.

Excerpts from january and february

H-19D NOSE GEAR DROPPED into ditch during landing ground roll. Tail boom rose and contacted main rotor blades. Minor damage to main rotor blades, tail rotor, drive shaft and housing, and tail rotor blades. No injuries.

H-23D TAIL ROTOR BLADES contacted tree during hover over road strip. Incident damage to both tail rotor blades. No injuries.

H-21C ENGINE OVERSPED to 3300 rpm after engine start. Overspeed necessitated engine change. Primer found corroded and sticking in open position.

L-23D INBOARD COWLING of left engine flew open during takeoff. Wind force sheared upper cowling hinge pin and cowling separated from aircraft. No further damage.

U-1A ENGINE FAILED in flight. Aircraft completed forced landing with no damage. Caused by impeller failure.

L-23D MISSING during flight over mountainous terrain. Aircraft found crashed on mountain. Both occupants killed at impact. Aircraft destroyed.

H-13G STRUCK TREES during takeoff from confined area. Minor damage to main rotor blade. No injuries.

U-1A LANDED HARD on left landing gear. Left gear punctured fuselage at sloping bulkhead. Propeller blades bent. Left aileron outer edge bent. Sudden engine stoppage resulted. No injuries. Aircraft was landed with near maximum gross weight.

H-13H SETTLED WITH POWER and struck ground in an approximate 1,200 fpm descent. Aircraft bounced on impact, turned to right and struck on left skid. Impact burst bubble, broke away right fuel tank, and ruptured left fuel tank. Pilot and passenger escaped with no injuries. Aircraft destroyed.

H-23D CRASHED in open field approximately 1 mile south of takeoff point. Aircraft caught fire and burned. Pilot killed. Suspect failure of first stage planetary gear and rotor separation. Investigation continues.

L-20A ENGINE FAILED in flight. Aircraft landed with no damage. Suspect fuel starvation.

H-34C DOOR FLEW OFF and was drawn into main rotor blades while aircraft was taxiing to parking area. Cargo door demolished. Three main rotor blades damaged. Cause undetermined pending investigation.

L-20A TAXIED INTO tractor, causing incident damage to elevator and horizontal stabilizer.

L-19A ENGINE FAILED in flight. Aircraft landed with no damage. Suspect carburetor ice.

H-13G LEFT WINTERIZATION COWL blew off in flight and struck left side of horizontal stabilizer, causing incident damage. No injuries.

BETTER—BUT NOT GOOD ENOUGH!

The number of Army Aviators killed per thousand per annum was 3.4 for calendar year 1960, a reduction from 4.2 for calendar year 1959. This reduction is encouraging in view of the increase of crew-served aircraft. BUT THE GOAL IS ZERO!

Induction System Ice

John T. Neher

INDUCTION SYSTEM ice in the L-23D follows two definite patterns: "elbow" and "throttle" ice. The term "elbow" ice refers to ice accumulation on the inside surface of the 90° elbow located directly behind the carburetor. "Throttle" ice refers to ice accumulation on the throttle butterfly.

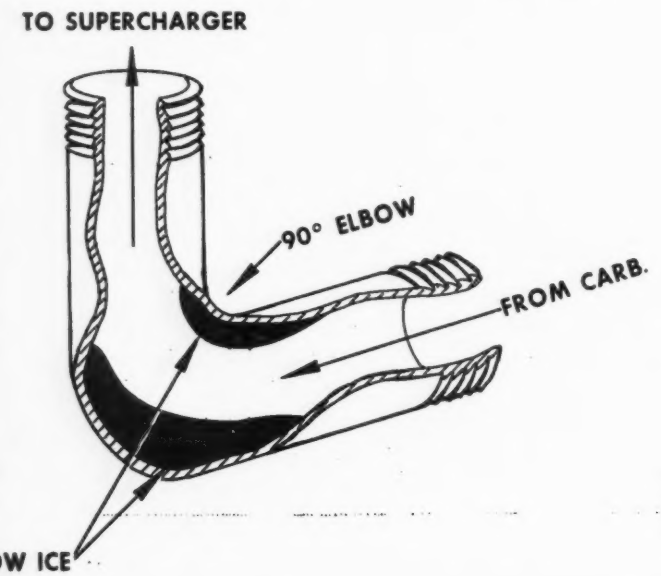
Elbow ice is considered responsible for most 0-480-1 engine roughness when operating in visible moisture and temperatures between −2°C and +10°C. Under ideal conditions, elbow ice can form in a matter of seconds. No manifold pressure change warns of this ice buildup. Engine roughness is the first indication that ice has formed. Engine roughness varies directly with the amount of ice buildup, from occasional coughing to surges of power in varying degrees of intensity.

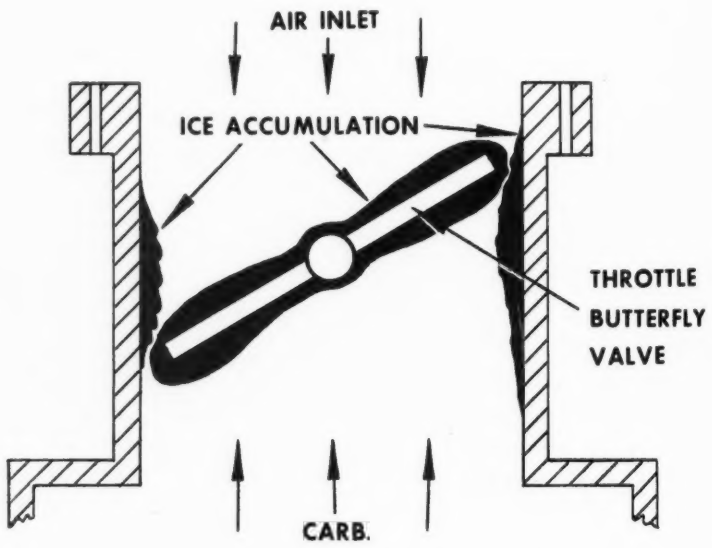
Ice formed in the elbow has an insulating effect. This insulation from the cold air stream allows warm cowling air to heat the elbow. The heat causes the ice to loosen and move on through the supercharger in masses large enough to momentarily interrupt combustion. Repetition of this process causes occasional roughness as the ice formation breaks loose. Intervals and severity of roughness are directly proportional to the amount of ice buildup. Ice buildup is directly proportional to airflow and saturation when temperatures remain constant. Temperatures near freezing are most conducive to rapid ice buildup.

Throttle ice is readily detected by manifold pressure drop. This ice is not caused by fuel vaporization, but is a result of supercooled water contacting the butterfly. No particular engine roughness accompanies the buildup of throttle ice; however, it is usually accompanied by elbow ice. Throttle ice is only encountered with temperatures very close to freezing. Accumulation of throttle ice is much more rapid with the air filter removed. When conditions are right for throttle ice to form, the air filter will usually freeze over, thus allowing warm air to enter the system through alternate air doors.

In the event induction icing is experienced, indicated by power loss, rough engine operations, or surging power, apply full carburetor heat and leave in this position until reaching a carburetor temperature of 55°C - 60°C. Maintain this temperature while flying through visible moisture. Application of full heat under severe icing conditions may show an initial decline in performance; if ice has accumulated,

Mr. Neher is an instructor with the Instrument Division, Dept of Advanced F/W Training, USAAVNS, Fort Rucker, Ala. He is fixed wing rated and instrument qualified, with approximately 13,300 flight hours.





additional engine roughness is usually observed.

Application of full heat is a good method of checking for induction ice in the 0-480-1 engine. If the engine becomes momentarily rough when full heat is applied and then smooths out, it is most likely that induction ice was present. Maintaining a carburetor temperature of 55°C - 60°C will keep the induction system clear of ice under the most adverse conditions.

Throttle ice, indicated by a drop of manifold pressure, is of little consequence because it requires very little heat to prevent and is often taken care of automatically, as ice usually forms over the filter. Never remove the filter in anticipation of flights through snow or sleet. Ice formation is much more rapid when the filter is removed, and the alternate air doors cannot perform their function without the filter.

To prevent induction ice during takeoff and climb when outside air temperature is between −5°C and +10°C and there is visible moisture, after engine checks and just prior to takeoff, set the engines at 2600 rpm with prop controls in full low-pitch position. When outside air temperature is above 0°C, pull out carburetor heat control until 1/2 inch drop in manifold pressure is observed. Take off with heat control in this position. When outside air temperature is below 0°C, use the same procedure except the heat control is pulled out until 1 inch drop in mp is observed. As soon after takeoff as time permits, adjust controls to maintain temperature in range of 55°C - 60°C. Use of carburetor heat above 74°C could result in material damage to the engine. Frequent checks should be made to avoid exceeding temperature limits. □

★ ★ ★

Flight Hazards from Icing

A year ago the Federal Aviation Agency released a bulletin detailing the basic hazards of icing conditions in flight for piston-engine aircraft, the kind of protection required, and the operational practices recommended to assure the maintenance of control. In case you failed to see a copy, mislaid it . . . or have just plain forgotten it, here 'tis again. [Reprinted from FSF Pilots Safety Exchange Bulletin 60-109.]

ACCIDENT AND CRITICAL incident reports reveal that many private and professional pilots may not be aware of the many ways in which icing can seriously affect the pilot's ability to maintain flight control during instrument flight. It is also known that many operators are unaware of the kind and amount of protection needed to cope with light, moderate, or heavy icing conditions.

External icing (impact, rime, clear, etc.) is most probable when flying in air with visible moisture (cloud, drizzle, rain, or wet snow) and at temperatures from 32°F to 20°F. Even in air temperatures as low as −30°F, there are many known cases of encountering heavy icing when flying in such supercooled moisture conditions. Depending upon the degree and form of moisture present, and upon the air temperature, ice accretions on an airplane's wing and other external surfaces may form slowly or with alarming and dangerous rapidity.

FLIGHT HAZARDS FROM ICING

The basic and critical icing hazards in flight are as follows:

1. **Icing of outside pitot/static pressure sources and venturi units.**

a. Erroneous airspeed, altimeter and rate of climb indications.

Whenever the pitot or static air pressure sources or lines freeze fully or partially, the airspeed, altimeter, and rate of climb instrument indications will no longer be correct. This grave situation can cause the pilot to exceed the airplane's limitations unknowingly, to break up the airplane in flight, or to fly unknowingly into the ground.

b. Erroneous direction and attitude indications.

Those airplanes that utilize an outside venturi unit to provide power for vacuum driven gyros, and which are not located within the engine's exhaust gases, are very susceptible to ice accretions on the venturi tube. This in turn reduces the vacuum and the gyro will no longer give accurate attitude or direction indications. (The pilot must have at least one

properly functioning gyro instrument to maintain flight control on instruments.)

2. Accumulation of dangerous ice loads on the wing and tail surfaces.

This situation changes the airflow and reduces the available lift while increasing the load the wing has to carry. It can also jam flight control surfaces if the buildup occurs near hinge points or between fixed and movable flight surfaces. In extreme cases, the combined effects of ice load and loss of lift will force a plane down. Further, the wing will stall out at considerably higher than normal stall speeds.

3. Accumulation of ice on propeller surfaces.

This situation creates a serious vibration problem and a loss of propeller effectiveness. The first indication to the pilot of propeller icing will be cycles of increasing vibration, followed by a sudden vibration increase as the ice from one propeller blade breaks free, followed by a period of vibration-free operation after all ice is thrown free from both propeller blades. The situation also causes a decrease in airspeed at a constant altitude and throttle setting. On multiengine airplanes, the pilot may hear chunks of ice impinge on the side of the fuselage as they break free of the vibrating propeller blades.

4. Carburetor icing and air intake clogging.

Either condition results in loss of power. Carburetor icing is more difficult to control at high altitudes. This is because the available heat to cope with any icing is considerably less at altitude than at sea level for airplanes with nonsupercharged engines. A sea level engine can only develop approximately 75% power with full throttle at 8000 feet. Available carburetor heat may be reduced to an even lower percentage of that which would be available near sea level.

Carburetor air intake icing is usually the result of snow or sleet impinging on the intake screen. Such an ice buildup starves the engine for air. Carburetor air must then come from some alternate protected source to maintain power.

5. Windshield icing.

The loss of windshield visibility from icing is most hazardous to the pilot when attempting an approach and landing. An openable window to see forward or a means for de-icing the windshield is needed to provide the necessary forward vision at such times.

6. Radio and pitot mast icing.

Ice buildup on these masts can create air disturbances and bending loads for which they may not have been designed. If so, the mast may bend or break off. The pilot will then be without radio or have erroneous airspeed/altimeter/rate of climb indications. It is also possible for the "run-back" from a heated pitot tube to freeze and cause an ice buildup on the mast that can adversely affect the air flow functioning of the pitot and static pressure system.

There are also two other possible icing hazards, namely: impact or runback freezing of (a) the controls for the carburetor air preheater and the throttle, and (b) a fuel tank vent becoming clogged with ice which would in turn cause fuel starvation. Fortunately, these two hazards do not seem to materialize very often. Frequent checking of the throttle and heater controls for freedom of movement is a method of knowing that they remain operative. If fuel starvation does occur from vent icing, switching to an alternate tank may provide power for a limited time, or if a common vent line is accessible to the pilot, it may be possible to sever it to provide an emergency vent.

OPERATIONAL PRACTICES

As can be readily seen, icing protection is needed for all of the above areas that are vital for maintaining flight control in any actual icing condition while flying on instruments. The degree of protection is dependent upon the amount and rate of ice accretion with which the de-icing or anti-icing equipment can cope. At best, the de-icing equipment that is usually provided on current models of nonair-carrier airplanes cannot be expected to cope with heavy or prolonged moderate icing conditions. The latter can be expected to tax the equipment beyond its capacity.

Should a pilot find himself in icing conditions without full de-icing equipment, his primary concern should be to use the equipment he has and to get to non-icing air as quickly as is safe. The following basic operational practices or flying habits should be observed:

A. Avoiding Conditions Conducive to Icing.

1. Monitor closely all weather reports in the vicinity, paying close attention to temperatures at the ground and any reported or forecasted icing conditions aloft. A 3°F to 4°F temperature drop per 1000 feet above the ground may be used to ap-

proximate temperatures at flight altitude above ground stations, if unknown.

2. Monitor closely the outside air temperature gage for temperatures favorable to external icing.

3. Follow a plan of safe evasive action which utilizes the following principles:

a. In clouds not near a cold or warm front, a lower altitude —if altitude permits—is usually warmer and any accumulated ice will melt. A higher altitude is usually colder and the visible moisture will likely be in a frozen state which cannot cause any further ice buildup. Any accumulated ice will gradually sublimate (vaporize) when getting into dry colder air.

b. In freezing precipitation near a warm front, a higher altitude will usually be warmer (warm air usually overruns cooler air near the ground). If at sufficient altitude, it may also be possible to descend into warmer air near the ground with non-icing conditions.

c. In clouds or precipitation near a cold front, advantage may be taken of the difference in temperature ahead of and behind such a front and the tendency of the cold mass of air to wedge under the warmer air ahead of the front. Thus going towards a cold front in temperatures conducive to freezing, a higher altitude will likely avoid icing both ahead and behind the front.

d. 2a, b, and c apply to procedures recommended for pilots in nonpressurized aircraft. If operating a pressurized plane and conditions permit, it is suggested that the crew depressurize and use the cabin altimeter as a rough indication of aircraft altitudes. Since many aircraft have the static source for this indicator isolated from the basic static source this procedure may provide reasonable altitude information. [FSF PSEB 61-100]

4. Flight speed and attitude indications should be closely watched and doublechecked. Cross-checking the artificial horizon or attitude gyro instrument with the airspeed indicator and the altimeter is a means of making certain that ice is not affecting the accuracy of airspeed/altimeter/rate of climb indications. Maintaining a basic attitude is essential to avoidance of a stall or excessive flight speeds. Cross-checking an electrically operated gyro's indications with those of a vacuum operated gyro is also a check on the accuracy of their indications.

Note: At least five cases are known involving three current makes and models of multiengine airplanes in which the airspeed/altimeter/rate of climb indications became dangerously in error due to rain and moisture freezing in flight as the airplane climbed into freezing temperatures. In another known case involving another multiengine model that had a modified pitot mast installation, an ice buildup on the pitot/static head mast caused dangerous airspeed/altimeter/rate of climb indications from the disturbed airflow effects on the static pressure opening.

B. Emergency Icing Conditions.

1. If an ice load is accumulated that makes climbing to a higher altitude difficult or maintenance of altitude impossible, an emergency descent is mandatory and flight control must be maintained with primary emphasis given to airplane attitude and keeping a safe flight speed above the airplane's higher stall speed with such an ice load. If a landing is necessary, such speed must be maintained to touchdown.

2. In an emergency while flying on instruments, the pilot should rely on:

a. the attitude or artificial horizon gyro instrument to avoid a disastrous dive or stall;

b. the turn indicator, directional gyro, and attitude gyro to keep the airplane from entering a disastrous spiral; and

c. breaking out the glass in the altimeter or rate of climb instrument to get an emergency alternate static source which will give approximate altitudes, rates of climb or descent, and airspeed indications when the normal static pressure source has frozen.

In summary, pilots should avoid all heavy and moderate icing conditions, proceed with caution into areas where light to moderate icing is forecast, and should not engage in any instrument flight in air conducive to icing without having full de-icing equipment for the items vital to the maintenance of flight control. The vital areas of concern are: (1) speed, attitude, direction instruments that are dependent on the pitot/static pressure systems and venturi gyros, (2) wing and tail surfaces, (3) propeller surfaces, (4) carburetor air fuel mixture and air intake, (5) windshield forward visibility, and (6) any radio or pitot tube masts that may be seriously affected by any ice buildups. □

Steam from the

Lieutenant Raleigh R. Meyer, Jr., Arty

CAMP SWAMPY AAF
SNACK BAR

Capt Jake Richards, leader of the 796 Army Flight Demonstration Team, to his wingman: "You know, Bill, that #$%& #$%& civilian that almost hit us today must have been sound asleep. I don't see how they can let a guy like that ever get his license. If the whole team hadn't reacted as they did, we wouldn't be here now."

MIDCITY MUNICIPAL
COFFEE SHOPPE

Copilot George Mason of Trans-Everywhere Airlines, to the rest of the crew: "They sure are putting a bunch of irresponsible jerks through flight school these days. You know, when I was in the Service, they would have grounded me forever if I had buzzed an airliner. It just doesn't make sense that a formation of light planes would try to buzz an airliner."

CAMP SWAMPY AAF
SNACK BAR

Lt William Cosgrove, IP in the instrument school, to a student: "Well, you had a good example of what to expect from the commercial airlines this morning. Those people have a schedule to make, and they come busting down through the smallest hole in order to save a minute or two, instead of waiting for approach clearance. If you had been under the hood instead of looking out the side, he would have hit us. I guess that bears out the old adage that one peek is worth a thousand cross-checks."

MIDCITY MUNICIPAL
COFFEE SHOPPE

Sam Stevens, civilian pilot and salesman, to one of his customers: "I used to think that flying was safer than driving a car, but after today, I'm not so sure. Some military pilot cut me out of the traffic pattern just as I started to turn onto final. I think that he was flying an aircraft they call an L-20; at least that's what he told the tower. Anyway, I had to dive to keep him from running over me."

* * *

Are these conversations far-fetched? If you think so, try this experiment. Ask a representative group of pilots this question: "When you see that you are on a collision, or near-collision course, with another aircraft, who usually takes action to avoid the collision?"

You will be surprised at the answers you get. Almost all will answer that the "other guy" never gets out of the way. The consensus of opinion is that the other fellow is just driving through the sky, not paying the least attention to other aircraft.

If this is true, it stands to reason that each one of us misses seeing a lot of other planes. Let's look at a couple of reasons why we don't see the other plane, and what we can do about it.

One reason, as most people know, is that each plane has its blind spots. We can partially overcome these by making climbing and descending turns, clearing ourselves as we go. It's not a bad idea either to make a turn every few minutes while flying cross-country to make sure that someone is not letting down or climbing up into you.

Another factor is "pilot letdown" after a long flight. We all have experienced the feeling that we have the flight "made" when the field is in sight. This, of course, is the very time that vigilance should be increased.

What can we do about this problem? In these days of high density zones and crowded airways ordinary vigilance is not enough. Pilots and copilots must be constantly on the lookout for other aircraft! Defensive flying is the order of the day. Don't assume any action on the part of another aircraft. He may see you; he may not. When the pilot's head is down, scanning a chart, etc., the copilot's head should be up—and turning. When flying alone be doubly vigilant! BE ALERT! BE SAFE! □

Lieutenant Meyer is a flight instructor with the Advanced Contact Division, Dept of Advanced F/W Training, USAAVNS, Fort Rucker, Ala. He is fixed wing rated and instrument qualified.

Memo from Flight Surgeon

The Student Aviator and the Flight Surgeon

Captain Robert L. Troske, MC

WHAT DOES the flight surgeon know about flight training? After all, he's a doctor whose job is to treat sick people — and incidentally, 'ground them' if necessary. I sure hope I won't have to see him—he's liable to ground me! Besides sick call is from 0730-0930 and during this time I either have to be at the flight line or in ground school. Furthermore, in ground school they told us not to miss classes and to see the flight surgeon on our own time." And on and on go the fantasies of the student aviator.

To begin with, the flight surgeon knows that coming to flight school is associated with an overall adjustment for the individual. He may be separated from parents, wife, children, the old gang, his old job, hobbies—the list is endless. Yet, the student frequently feels that this is a good thing; he reasons that now he is free to spend all of his time and energy learning to fly. And this is exactly what he does. He really works at it, day and night, and things are going fine.

Then the time comes when it takes him an hour to read six lines of aerodynamics, and to his bewilderment he can't tell you what he read. Why? Because he was thinking of the wife and kids, a movie he wanted to see, that secretary at the PX cafeteria, having a few beers with the boys, a good TV show he missed, nine holes of golf—this list is also endless. He says to himself, "What's wrong with me? I can't concentrate any more." But he solves the problem. He watches TV with a beer in one hand and the flight syllabus in the other. Now he doesn't learn anything, the beer gets warm, and the TV program wasn't worth the effort.

Then begins the struggle with his conscience. His impulse is to go out and have some fun. Yet, he is on the fence because he got a below average on yesterday's flight and he feels he should study. He doesn't realize that he would absorb twice as much aviation material if he wholeheartedly played nine holes of golf for 2 hours and then studied for 2 hours. He knows that a person can't do two things at once and that all work and no play are no good. Yet he doesn't act on this knowledge.

The flight surgeon knows that many flight students become increasingly anxious and are then unable to hack the program, not because they haven't tried, but because they have "tried too hard." Their trouble comes from their inability to utilize old interests and/or find new interests. These outlets blow off steam and act as substitutes for the people and things he enjoyed before coming to flight school. Learning to fly is hard work, but the student who lets it occupy all of his time is in for trouble.

The senior field grade officer may find himself in a unique position. He has to compete with these young bucks in learning to fly. In addition, by virtue of his rank, he may be designated class leader and therefore looked up to as the Old Man. Also command expects him to help with some of the administrative routine. So the senior officer, proud of his leadership ability, may leadership himself right out of flight school by spending all of his energy trying to solve other people's problems. In so doing he neglects his basic mission: learning to fly.

It is important that the student be physically fit while he is learning to fly. The common cold is the greatest source of medical harassment to him, both physically and mentally. If he has a "head cold which hangs on" in spite of the usual household remedies; or stated in another way, if he has persistent nasal congestion and feels that his "sinuses are all plugged up," he should go on sick call. The flight surgeon's job is to check the student to see that nothing serious exists. He knows that, in a manner of speaking, the student can't afford to have a cold. So he is not about to ground a student unless he has an ear or sinus block or unless the student is just plain "done in" with his cold symptoms and needs a day off. In almost every case the student aviator with a cold is given medicine so that he can continue on full flying duty.

Another case in point is a bout of the G.I.s. The flight surgeon knows that a fellow may be able to ride a desk while experiencing a bout of upset stomach and diarrhea.

Captain Troske is an aviation medical officer with the U. S. Army Aviation Center.

But he also knows that you can't fly an airplane under those conditions. The flight surgeon will examine you and rule out any serious condition. In addition he will give you some medicine to arrest the G.I.s and in all probability you will miss only one day of flying.

The student aviator may find it difficult to understand why sick call is held at such an "inconvenient time." He may wonder why he can't come to the flight dispensary at any time; after all, he's sick. In reality he is welcome to visit the hospital at any time for an emergency. If he wishes to talk to the flight surgeon, he should feel free to call. If his problem can't be answered over the phone an appointment can easily be made. We have found that this system cuts down on waiting time, allows more people to be seen, and facilitates a doctor-patient relationship.

During the orientation period the student aviator asks for and/or receives a raft of "tips from the top." Upon arrival at the flight line his mind may be filled with a host of facts, fantasies, advice, misinterpretations, all calculated to aid him in his desire to learn to fly. However, his fears are quickly dispelled because of his instructor's reassuring manner. Further, he is amazed with his instructor's remarkable skill as a pilot. When the orientation flight is over the student is flooded with self-confidence and enthusiasm. He knows that this Old Pro won't let him get hurt and he wants to fly like him. The student who uses his IP's proficiency as an immediate goal is in trouble. The instructor who doesn't take grades and debriefing seriously is remiss because this is the only real way for the student to know where he stands.

Soon the student may see his instructor as possessing all degrees of superhumanness. The instructor, an excellent pilot but a human being with both assets and liabilities, may become infallible in the student's mind. Under this illusion the student's fears evaporate. He is now capable of outstanding performance under the influence of this anxiety-reducing, perfect instructor. His grades are very good. It won't be long before he will be ready for solo. The instructor has reassured the student (?) (or himself) by telling him, "A couple more hours and you will solo — no sweat." The student slacks off; he doesn't feel enough anxiety; he knows the old pro won't let him down, why he has never even yelled at him. And his instructor overlooks little things; after all he doesn't want to do anything that might disturb this perfect relationship.

Then the bubble bursts: the student gets a grade of unsatisfactory and of course neither student nor instructor can understand it. Everything was going so well, too well. The student doesn't realize that you don't learn to fly on good graces alone. He doesn't realize that the instructor was too much concerned with running a popularity contest. The student is not aware of the role he played in manipulating his instructor into being a "good guy."

If the student weren't so sensitive and the instructor not so afraid that the student might get mad, they could have communicated better with each other. The student might have been able to first consciously recognize and then verbalize his feelings—his fears, his anger. He would have formed a closer relationship with his instructor. He would have been realistically anxious about his check ride; and he would have passed it!

The instructor pilot knows the importance of personality factors in flight training. He tries to understand his student as he tries to teach him to fly. However, his basic function is to teach and not try to rebuild a student's character. Personality clashes are normal and inevitable in flight training, and the people on the flight line as well as your flight surgeon are anxious to help with difficulties of this type. There is one thing that the student must bear in mind: namely, that his instructor is not about to change. If his instructor is a chipper and the student has a problem in relating to a chipper, it is the student's problem to adjust to it. Or if the student recognizes that he is uncomfortable because his instructor talks very little during the flight, he must accept the fact that the instructor will never be the type of guy who floods the cockpit with chatter and reassuring innuendoes. If the student feels at an impasse with his instructor, he won't be the first student who has felt this way or the first student who has gone to his flight commander and/or flight surgeon for help.

What about airsickness? Show me the student who hasn't felt a little green during the first days of flying. Maybe even before coming to flight school the student had an orientation ride with, if you will, a somewhat sadistic aviator who proceeded to give him ev-

ery aerobatic maneuver in the book, and he really got sick. Maybe this same student was unable to tell the pilot to knock it off and one could argue that the student was asking for it. Fear of becoming airsick or airsick again is a normal and not uncommon feeling during the early days of training.

The flight surgeon knows that airsickness of various degrees is a common problem. He would like to try to help the student with the problem early, i.e., before it interferes with proficiency. This is why flight commanders send the airsick student to the flight surgeon. It is not the flight surgeon's intention to recommend elimination from flight training because the student was airsick. Rather the flight surgeon wants to help the student to be as proficient as possible. In the final analysis, airsickness leads to flight deficiency in most instances, which is why the student doesn't become an aviator.

In summary your flight surgeon would like to be simply a good family doctor. This sort of a doctor is hard to come by in the military service, but he is available to aviators. The flight surgeon knows that getting your wings is no picnic. Let's face it. Aviators are a healthy bunch of people, but your flight surgeon wants to help you with your overall adjustment to your chosen field. Your demands may be unreasonable and/or unrealistic and your flight surgeon is not omnipotent but he cannot begin to help you unless you come to him. Remember student aviators have been coming to flight surgeons for years. In essence, they solved their own problems but they, like all of us, need help at times. □

Overweight Aviators

With Thanksgiving, Christmas, and the New Year festivities (and food) under our belts, perhaps the time is now to remind the plump pilots of the penalty of overdoing the food bit, namely, low-calorie dieting. Following are two possibilities or alternate courses that will lead to reduced girth for gourmets:

1. Attendance at a Navy Survival School. One recent participant reported he lost six pounds in three days on a diet of ants, snails, cactus, and rattlesnakes!

2. Adherence to Suggested Diet, to wit:

	MONDAY
Breakfast:	Weak tea
Lunch:	One bouillon in ½ cup of diluted water
Dinner:	One pigeon thigh, 3 oz. prune juice (gargle only)
	TUESDAY
Breakfast:	Scraped crumbs from burned toast
Lunch:	One doughnut hole
Dinner:	Three grains of cornmeal, broiled
	WEDNESDAY
Breakfast:	Boiled-out stains of old tablecloth
Lunch:	One tail joint of sea horse
Dinner:	Three eyes from Irish potatoes (diced)
	THURSDAY
Breakfast:	Two lobster antennae
Lunch:	Bellybutton of navel orange
Dinner:	Rotisserie-broiled guppy filet
	FRIDAY
Breakfast:	Four chopped banana seeds
Lunch:	Broiled butterfly liver
Dinner:	Jellied vertebrae a la centipede
	SATURDAY
Breakfast:	Shredded egg-shell skin
Lunch:	One-half dozen poppy seeds
Dinner:	Bee's knees and mosquito knuckles sauteed in vinegar
	SUNDAY
Breakfast:	Pickled hummingbird tongue
Lunch:	Prime rib of tadpole, aroma of empty custard pie plate
Dinner:	Tossed paprika and clover-leaf salad

NOTE: A 7-oz glass of steam may be consumed on alternate days to help in having something to blow off.

Inclusion of this diet in an FSF bulletin does not signify FSF's [or the DIGEST'S] acceptance of it as SOP or recommended SOP for overweight airmen. Follow the line of least resistance . . . and the shortest one around your middle: Eat well but wisely, and if you have to diet, follow the plan approved by your [flight surgeon].—Flight Safety Foundation, Inc., Bulletin 61-1. □

Try it DRY

Major Pierce L. Wiggin, USAFRes

WHEN MESSRS. Martini and Rossi invented their noble drink, they tossed a coin to see which of their names would be immortalized. Martini won. Since that time the martini has undergone an evolution equal to, if not greater than, that described by Mr. Darwin.

The Martini and Rossi firm, producers of dry vermouth, were well pleased with their original concoction of half vermouth and half gin. They had every reason to look forward to a rich and rewarding future. That is, until some unworthy elected to try his martini just a little drier. He mixed it with two parts gin and one part vermouth. This started a trend. Someone else decided on four parts gin to one part vermouth.

It went on and on—

Eight to one—

Sixteen to one—

Thirty-two to one—

Pass the vermouth cork over the shaker and stir lightly so as not to bruise the gin.

This process reached its climax at a recent meeting of the Liars Club where the following account was recorded:

"A bartender at Yucca Flats became so annoyed with the demands of his customers for drier and drier martinis that he grabbed up a bottle of vermouth, rushed out to the flats and taped it to an atom bomb. The bomb was exploded and the bartender began using this formula: Pour gin into covered shaker. Remove cover for 10 seconds, allowing vermouth fallout to enter. Serve immediately and cover glass to prevent dilution by further fallout."

* * *

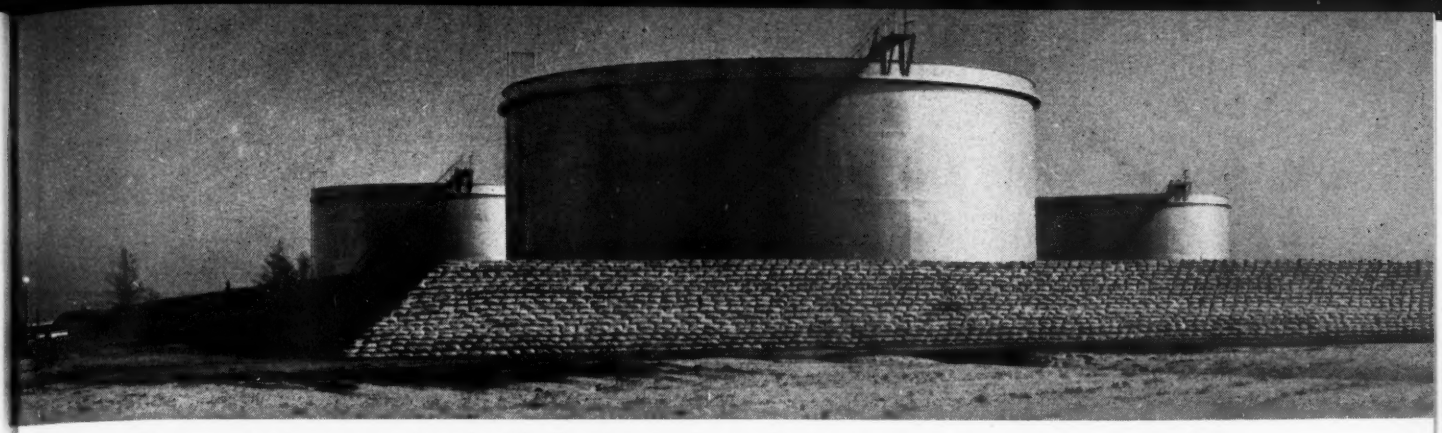
Aircraft engines, not to be outdone by their human counterparts, have continuously demanded ever drier and cleaner fuels. With the advent of JP-4, fuel handling has become an exacting process. It must be kept dry. And it must be stripped of contaminants before it enters aircraft fuel tanks. If it isn't, jet and turbine engines, like the Yucca bartender's customers, just won't tolerate it.

Best way to learn about handling JP-4 fuel? Ask an expert.

While at Brookley Air Force Base, we talked with Mr. A. C. Grimes, Base Fuel Supply Officer. Mr. Grimes, who has been handling JP-4 for years, gave us the following tips:

JP-4 requires more delicate handling than gasoline. The mixture of fuel and air above liquid gasoline in a tank is usually too rich to support

Major Wiggin, Chief, Literature Division, USABAAR, Ft Rucker, Ala., wrote this article while on two weeks' duty with the Air Force at Brookley Air Force Base. A fighter pilot during World War II, he has logged more than 7,500 flight hours.



Stowage tanks are equipped with floating roofs to eliminate space for vapor accumulation

combustion. Not so with JP-4. Its low vapor pressure gives it a far greater burning and explosive range. Put another way, the spark from a carelessly handled tool, a static electric discharge, or any of numerous other sources might fizzle in a gasoline tank. Allow the same spark around JP-4 and — BOOM!

Governors that control fuel flow to jet and turbine engines often balk at particles of contamination larger than five microns. When you realize that a micron is only one-millionth of a meter in size, you begin to get some idea of the need for exercising every possible precaution to ensure clean fuel. The answer is filtration. JP-4 filters contain many wafers of a material somewhat similar in appearance to that in your car's oil filter. These wafers, packed tightly together, filter out particles of contamination larger than five microns. Three large filters, each capable of filtering 600 gallons a minute, are used at Brookley to strip fuel clean as it moves from storage tanks to delivery trucks. In addition, each truck is equipped with a five micron filter to further clean the fuel as it is pumped into aircraft tanks.

One sure source of contamination is rust. Pump JP-4 into a rusty tank or through a rusty pipe and the result is contaminated fuel. This is because JP-4 quickly absorbs rust from any source.

Another characteristic of JP-4 is its ability to leak through apparently leak-proof joints, valves, etc. This calls for constant attention to storage tanks, delivery truck tanks, fuel transfer lines, valves, and pumps.

Perhaps the most serious operational hazard of JP-4 is its affinity for water. Pour water into gasoline and it quickly settles to the bottom. Pour the same water into JP-4 and it clings to the fuel. Agitate it and the water emulsifies like the powder in milk of magnesia. This is because the density (specific gravity) of JP-4 is very close to that of water. For this reason a much longer settling period must be allowed for water to separate and reach the bottom where it can be drained off. A good rule of thumb when filling storage tanks is to allow one hour for each foot in depth.

A prime source of water is condensation. If you refuel an aircraft outside, then bring it into a hangar for maintenance, there will likely be a change of temperature and resultant condensation. Here again the water must be given time to settle and be drained off. The next time you drive to work on a cold morning with the heater going, take a look at your windshield. This will give you a good picture of condensation and the amount of water it can produce.

The martini has reached its driest possible state. Let's help JP-4 fuel toward that same goal! □

Clean, dry JP-4 fuel is delivered ready to go to work

WHILE ON FIRM GROUND

...$2 Million Shot

HEADING FOR a field strip the aviator relished the feel of the Iroquois. It was handling nicely and the instruments were right on the button; this was a great helicopter.

Locating the strip he came to a high hover and an aviator on the ground guided him to touchdown. As the HU-1A settled, the pilot started shutdown procedure. He locked collective pitch, pulled off his helmet and after letting the tail pipe temperature stabilize, he shut the engine off. He shut down the radios and switches. Overhead he pulled the two circuit breakers for starter and ignition and retraced all switches for a proper shutdown, including that of the heater.

Prepared by the U. S. Army Board for Aviation Accident Research.

Releasing his safety belt, the pilot was about to leave by the cargo door when he noticed smoke moving between the pedals in the front of the aircraft.

"Hey! We're on fire, get out," the pilot shouted to his passenger.

They both exited through the copilot's door just as they heard a muffled explosion. As the aviator glanced back over his shoulder he noticed the cowling had been blown, and there was fire all over the engine.

A sergeant ran toward him with a fire extinguisher, but he warned him back. "Stay away from the aircraft, and clear those people away," shouted the pilot, thinking the main tank was about to explode. It was then he noticed they were in tall, dry grass about 3 feet high.

In a matter of minutes the aircraft was totally destroyed by fire . . . $296,000 up in smoke. The grass fire was finally gotten under control by ground personnel.

This accident cost 15 percent of the $2 million estimated to be lost due to aircraft accidents on the ground during 1957-1960.

In this accident it was established that the heater exhaust, located just 14 inches above the ground and registering some 700°F. while operating, had started the brush fire that demolished the HU-1A. Also it was discovered that similar instances of brush fires had gone unreported.

A relocation of the heater exhaust in the HU-1A was recommended. Originally the request was turned down. It was stated that the safety of flight message requiring pilots to turn off the heater before landing was sufficient for a fix. However these are two reasons why this does not always work.

1. In cold weather the pilot needs the heater to keep his

bubble from fogging and obscuring his view on approach.

2. Having to reach up and turn off the heater can be a distraction on landing, and already one pilot has wrecked his aircraft for this reason. The recommendation was considered again and aircraft already in the system are not scheduled to have the heater exhaust relocated.

This accident was one of the many ground types studied at the U. S. Army Board for Aviation Accident Research on a project to determine areas in ground operation procedures that could be improved.

It should be underlined here that only ground operations **incident to flight** were studied. This eliminates a big stack of costly accidents that also occur while the aircraft are on the ground.

During the period July 1957 to June 1960 Army Aviation accident experience on file at USABAAR indicates that 189 Army aircraft were involved in 75 major accidents, 64 minor accidents, and 50 incidents during ground operations. These are reportable under the provisions of AR 385-40 as changed, for USABAAR records do not contain information on aircraft damaged not incident to flight or intended flight.

The estimated loss was $2 million, but it should be stressed that for this period under consideration 15 percent of the total loss was the one HU-1A destroyed by grass fire. Estimated cost of modification of the aircraft in the Army inventory is $86,000.

ROTARY CRAFT MORE VULNERABLE

It was easily established that the rotary wing aircraft sustained damage far more easily while on the ground than do fixed wing aircraft. The accidents were classified as follows: Fixed wing, 25 major, 49 minor, and 19 incident. In rotary wing aircraft, however, there were 50 major, 15 minor, and 31 incident.

Weather is of a greater danger and field strip operations are more hazardous for helicopters than for fixed wing aircraft. Materiel failure is more prevalent in rotary wing aircraft. Congestion, or crowded taxi areas, causes a large part of damage in both fixed wing and rotary wing ground operations.

Pilot goofs are more prevalent in fixed wing operations, but the largest single factor in either type aircraft accident is the human factor.

Ground guides, whenever possible, should be used in parking aircraft. Furthermore they should be specifically trained in the ground performance and the peculiarities of the type of aircraft they are directing. This is more important in the helicopter where the danger potential is greater.

SOPs that prove either inadequate or nonexistent are a large factor in rotary wing ground accidents.

UNREPORTED NEAR MISSES

It is safe to assume, from this study, that a large number of near misses, close calls, and unsafe practices are unreported and not corrected until an actual accident occurs. Reportable aircraft accidents not involving materiel factors are in most cases due to pilot factors. These usually involve a degree of inattention, distraction, disorientation, or an attempt to operate in congested areas without ground guides. Since by definition aircraft mishaps are not reportable as aircraft accidents unless incident to flight, substantial losses in money, manpower, materiel, and operational effectiveness are not on record at USABAAR.

POTENTIAL DANGER NOT REALIZED

Not fully appreciated is the potential danger inherent in aircraft on the ground. Comparatively few such accidents have resulted in injuries or fatalities to personnel. (One outstanding exception to this was one fatality and another serious injury in a recent case of helicopter ground resonance incurred while taxiing.)

Aircraft on the ground are thought of in terms of ground vehicles. The potential destructive power and radius of destructive action of propellers and rotor blades, whether attached to the aircraft or acting as missiles, is not given proper consideration or respect.

Usually less spectacular than flying accidents, ground mishaps have little news value and receive little publicity. Primarily they are considered a nuisance and an embarrassment to the command, and unless bizarre are investigated as quickly and quietly as possible. Corrective action usually taken is to change existing SOPs or to write new SOPs to cover any such future possibility. Thus, again, the publicity given ground accidents is generally negligible.

CONCLUSIONS

It is possible to sum up a few ideas on this matter of the ground aircraft accident that is so costly yet creates such little interest. It is nearly impossible to write an SOP that will cover all contingencies, human foibles, mental aberrations, natural and unnatural phenomena, mechanical cussedness, and just plain stupidity that covers the range of accidents to aircraft on the ground.

Even if it were possible to write such an SOP, it would not prevent accidents. Accidents can only be prevented by regulations that are understood, observed, and enforced. But one more word: common sense in handling the aircraft, plus a continual awareness of the existing dangers, should reduce this type of accident to a minimum. □

Emergency Landings

EVER GIVEN much thought to what you would do if

— you damaged a horizontal stabilizer, wingtip, or gear on takeoff?

— your flaps stuck in a down position?

— your engine failed to throttle back?

— your gear failed to lock down?

What would be **your** reaction? Get it back on the ground? Bail out? Before considering either course of action there are several things to do.

DECLARE AN EMERGENCY! Although the damage may **appear minor,** there may be internal or concealed damage. Bent or torn metal on control surfaces may prevent full travel needed for a landing. Although you may be able to shake down your gear, it may not be fully seated. The extra protection of a crash truck and ambulance are there just for such emergencies. USE THEM.

Another factor to consider is the assistance of persons on the ground with much experience with such problems. The tower operator can have a maintenance expert on hand in minutes. A search through handbooks or a call to a tech rep can aid you in coming out with a whole skin and saving a valuable aircraft. If you have excess fuel on board (and decide to try to land the aircraft) you want to burn it off or jettison it anyhow.

Use the gas and time to get that valuable assistance.

CRASH SENSE

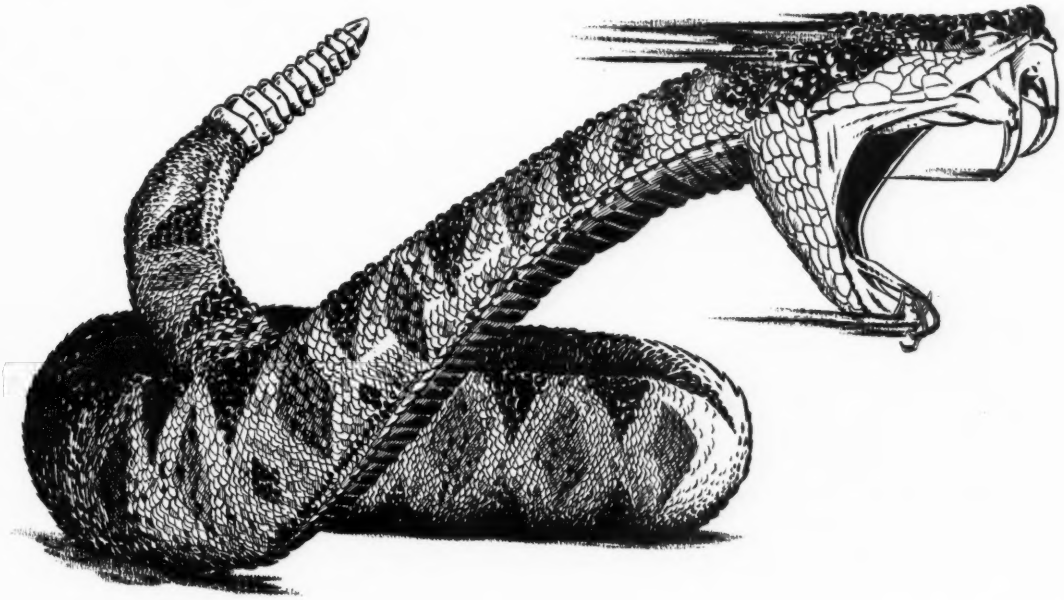
PREPARED BY THE UNITED STATES ARMY BOARD FOR AVIATION ACCIDENT RESEARCH

FAIR WARNING

CHIPLEY, a town in north Florida, has a unique annual rodeo during which the townspeople and visitors from many miles around scour the countryside in search of rattlesnakes. Experienced rattlesnake hunters say (and we'll take their word for it!) that the rattlers always give ample warning before they strike.

Accidents, unlike rattlesnakes, don't always let you know in advance of their impending strike. But occasionally, you can hear, feel, see, and smell an accident waiting for a place to happen. Mostly, these warnings come as a set of circumstances which shift the odds from unlikely to probable. There may be a faulty attitude or some physiological or psychological factors which point the way to a fatal mistake. These are usually manifested by a series of incidents or less serious accidents.

The term **accident prone** has been used to identify individuals who fall in this category. But **accident prone** is itself misleading because it may make the individual think there are kinds of people who have accidents (i.e., the **accident prones**) and some that don't (the normals). This can be very comforting. It can lull pilots into a state of complacency, an attitude of **it happens to the other guy—not me!** With this firmly in mind, let's review a



set of accidents leading up to a final tragic crash.

Accident No. 1

This accident occurred while the pilot was in training. He made a power-off approach to a road strip. The aircraft touched down, bounced slightly and skidded toward the left side of the road. The left wing struck a small tree and the Bird Dog plowed into the left bank of the road, causing major damage.

Accident No. 2

The very next day, following accident number 1, the pilot was making a power approach to a field strip. The aircraft touched down about 300 feet from the approach end of the strip, bounced slightly, rolled further and the tail came up, causing the propeller to strike the ground. The aircraft then nosed over and came to rest on its back. This one also caused major damage.

Accident No. 3

This one happened after the pilot had graduated from training and built up a total of 250 flying hours. While taxiing on a road strip, the left wing of the Bird Dog struck a tree limb and caused an uncontrollable 40° turn and major damage.

Accident No. 4

Flying a Sioux this time, the pilot was making an approach to a strip, slower and steeper than normal, with the aircraft in a nose-high pitch attitude. Instead of flying in a normal manner with right hand on the cyclic and left hand on collective pitch, he was flying with his left hand on the cyclic and his right hand on the collective pitch of the passenger seat. The aircraft fell through from about 15 feet, landed hard, bounced, turned 35°, and slid to a stop. Again, the accident caused major damage.

Accident No. 5

Flying a Bird Dog, the pilot departed for an overwater flight. As he approached his landfall, the oil pressure of the Bird Dog dropped to zero. Engine vibrations began and blue smoke came from both exhaust stacks and around the engine

a. Copilot's collective pitch; b. cyclic stick; c. pilot's collective pitch. Error?

This was the result when the pilot, pictured at left, was faced with an emergency

cowling. The pilot elected to leave the aircraft over water; he jettisoned the door and bailed out. Landing in the water, he was dragged under by the weight of his survival gear. He pulled both lanyards of his life preserver, but it failed to fully inflate. Next, he released his parachute which had his life raft attached and both sank immediately. After remaining in the water for approximately 20 minutes, he was picked up by a fishing boat. The aircraft landed in the water and was destroyed.

Accident No. 6

This last accident started out as a Beaver flight of 1,600 nautical miles, with an en route estimate of 19 hours, all to be flown in one day. The pilot was alone during this long flight.

Takeoff was made in the early afternoon. A little more than an hour later, he reported over an en route station at 11,500 feet. He was evidently flying at that altitude to take advantage of tail winds. He made 2 fuel stops en route and continued to fly at 11,500 feet. Ten hours after takeoff, he approached a third en route fueling point and began his letdown. The time was midnight and the weather was 4500, scattered; visibility, 3 miles in ground fog at his intended landing field. There was mountainous terrain around the airfield and tops of the hills were buried in fog. Visibility was almost zero.

Sixth and final accident

With bright moonlight from above, the visibility obviously appeared good as the pilot began his letdown. But flying for a long period of time at 11,500 feet, smoking, and fatigue surely played a part in weakening his vision.

Shortly after midnight, the aircraft crashed into the side of a fog shrouded hill. Oak trees tore the wings away; the fuselage continued to the ground, slid forward and banged into the base of a tree. The pilot, killed at impact, was torn from the cockpit because neither his safety belt nor shoulder harness were fastened.

* * *

Long ago, the Royal Air Force invented Pilot Officer Prune who was the personification of the accident type.

AVIATORS TOLD TO FLY LOW AND SLOW

Reprinted from The Bayonet, *published at Fort Benning, Ga.*

Army Aviation, with its modern refinements and increasing contribution to battlefield mobility, can look back with humor on an ordinance passed just 58 years ago.

It was the first recorded action to make flying safer in a Florida city and read, approximately, as follows:

"No air machine will fly over any part of the city of Jacksonville at a height of 10 feet at a speed in excess of 8 miles per hour or at a height of 20 feet in excess of 15 mph, or at a height of 50 feet in excess of 30 mph or at any altitude whatsoever at a speed in excess of 50 mph.

"Air machines will be equipped with warning horns, braking devices, safety devices and a parachute to let the machine down if the engine stops.

"No air machine will collide with buildings or structures, public or private." □

P/O Prune crashed every type of aircraft in the Royal Arsenal and his antics were a source of amusement for thousands of pilots during World War II. Later, the U. S. Air Force began publishing the antics of a similar character named Mal Function. Mal, like his cousin Prune, does everything wrong and frequently ends up 10 feet underground.

It was long thought that the Army didn't have a character of this type. We think now it had at least one.

Know any others?

IT COULD HAPPEN TO YOU

Pacing up and down in front of the hangar, the pilot was impatient to get going. After all the raves about the value of the chip detectors, they had finally arrived for installation. Just this morning, the first H-21C was in the process of being modified with the warning light.

As assistant maintenance officer he had a special interest in these little buggers and he sure hoped they lived up to prior billing. He had heard that the H-19s had been equipped with the device for quite sometime now and had been known to give good performance in warning of incipient engine failure. Thinking as a pilot though, he was a trifle skeptical. Seems like a good aviator ought to know by the sound and feel of the ship if she was running right; and too, there was always the possibility they could be installed wrong or be mechanically defective.

The mechanics certainly were taking their time in there though, so he decided to have a look. But he didn't want to push the men even though he was anxious to get the hop over with and close up shop.

The crewchief waved him into the shop. He took a good look at the installation and told the men to prepare the helicopter for flight.

He took off at 1400 with two passengers aboard and went into his climb. At 200 feet the warning light flicked on. He scanned the instrument panel, checking the engine oil pressure and temperature. Everything was okay; he was making 60 knots. The light will probably flick off again, he thought; it must have been installed incorrectly. A Murphy!

But the light, warning of internal engine failure, stayed on and the pilot initiated emergency proceedings and prepared to land with power. He was over cultivated land but completed his landing back at the field.

In talking over the incident, the pilot said: "I diagnosed the trouble erroneously, thinking it was faulty installation of the chip detector. But I could not overlook the fact that the warning light was on; therefore, I classified the situation as an emergency and landed immediately. At the time the warning light came on the engine and instruments were operating normally and gave no indication of any sort of trouble except that the warning light came on."

The pilot acted correctly. Although he was almost 99 percent sure his engine was OK and the chip detector all wrong, he took the precaution of an emergency landing.

Back on the field, the ground crew and tower reported they had seen excessive dark smoke venting from engine compartment, but the pilot was not notified by the tower.

This could happen to you — with or without chip detector.

21 Ski-Do

Two ski-equipped Army helicopters proved their worth recently while supporting troops undergoing combat proficiency training in the rugged muskeg flats near Willow, Alaska.

Shaped like surfboards, the same type skis got their first hard test in the far north during the Mount McKinley rescue operation last spring (see AVIATION DIGEST, Nov '60).

The ski-equipped helicopters, participating with over 600 other Army aircraft in the annual training test, could land almost anywhere without breaking through the thin crust of snow-covered muskeg. This gave them a distinct tactical advantage over conventionally equipped choppers while deploying troops and supplies. □

Fort Lee Offers Aircraft Refueling Seminar

LIKE EVERYTHING ELSE in today's Army, aviation has undergone tremendous expansion and modernization. Where Army aircraft were once limited to observation type missions, today there exists a wide array of diverse types of planes with a corresponding diversity of functions. The advent of the helicopter alone has revolutionized the entire concept of Army mobility. In addition, there are now two Army airplanes which consume jet fuel: the HU-1A Iroquois and the AC-1 Mohawk.

These developments have necessitated the study of refueling in a new light. Different types of planes and various properties, specifications, and handling requirements of the fuels they burn have outmoded the age of drum and handpump operations. Complex problems of quality control and operational safety, especially in the handling of jet fuels, can hardly be expected to be resolved satisfactorily on the local airstrip by relatively inexperienced personnel.

This urgent need for adequate and expert advice on aircraft fuels is now met by a course conducted by the Petroleum Department of the Quartermaster School at Fort Lee, Va. The first course began on 23 January 1961. It is anticipated that eventually at least one individual from each Army installation with aerial operations will attend this and other courses to follow. Then he can share this training with personnel of his home strip.

During the 5 days of this course, students will receive instruction in the properties and uses of aviation fuels: safety measures, such as proper grounding and bonding of refueling equipment, and elimination of fire hazards; handling equipment, i.e., tank trucks, pumps and filters; and methods of storage. Here they will be familiarized with sampling and gauging techniques and with the various types of tanks and fuel supply systems, both fixed and collapsible. Proper emphasis will be placed on quality control and the various tests required to ensure that products meet specifications at all times. Knock principles, octane and performance ratings, and special problems involving additives will also be discussed.

The course will further provide instruction on proper fueling and defueling methods. A demonstration of the movement of fuels through pipelines, using the scale model glass pipeline of the Petroleum Department, will conclude academic instruction. Five hours of informal "trouble shooting" will complete the course.

All facilities of the Petroleum Department will be utilized. Handling equipment, storage facilities, and proper storage methods will be presented in the Petroleum Training Area, which comprises fueling systems, tank farms, and pipelines. The Base Laboratory of the department will present the quality surveillance story. The Fort Lee airstrip will be used for actual demonstrations of fueling and defueling of Army aircraft.

Attendance at this course should be informative and professionally valuable for any individual concerned with aircraft refueling operations.

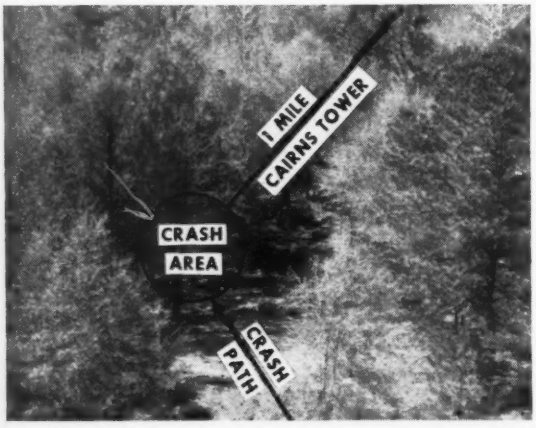
AVIATION FUELS HANDLING COURSE

Academic Subjects: 37 hours

Scope of instruction to include: Introduction to military petroleum (aviation fuels). Properties and use of aviation fuels. Safety measures. Quality surveillance. API gravity, color, visual, Saybolt and ASTM Union. Distillation and vapor pressure. Freezing point of aviation gasolines; interaction of water and aircraft fuels. Sediment contamination of fuels; corrosion, smoke point of jet fuel. Tetraethyl-lead. Gum, existent stability (introduction period) potential. Principles of combustion and knock engines and aviation method for rating aviation fuels. Petroleum dispensing equipment. Storage of JP-4 and aviation fuels. Glass pipeline orientation. Fueling and defueling of aircraft. Seminar. □

READY In Training Equipment

Left to right: Standing—Capt George A. MacDonald, copilot; Pfc Charles McCall, guard; Capt Raymond P. Bosworth, pilot. Kneeling — Sp/4 Bobby F. Grant, fireman; Sp/4 Louis R. Bailey, fireman; Sp/5 Alphis C. Letchworth, medic, not shown.



A DESERVING "well done" is in order for the Helicopter Crash Rescue Section, Airfield Command, Fort Rucker, Ala.

This group, utilizing the new air rescue bag (see DIGEST, Dec '60), recently removed an unconscious pilot from the flaming wreckage of a high performance type aircraft minutes before it exploded. The victim was flown 2 miles to the U. S. Army hospital and the mission was completed less than 14 minutes after the crash rescue bell sounded.

The air rescue bag is credited with saving at least 5 minutes and enabling the rescuers to remove the pilot from the plane before it exploded. It was the first time the bag, conceived by Maj Gen Ernest F. Easterbrook, commanding general of the U. S. Army Aviation Center and commandant of the U. S. Army Aviation School, has been used on an actual rescue mission.

Captains Raymond P. Bosworth and George A. MacDonald, both M.S.C., flew the rescue helicopter. Specialist Fourth Class Bobby F. Grant and Louis R. Bailey were the crash rescue firemen; Specialist Fifth Class Alphis C. Letchworth was the medic; and Private First Class Charles McCall the crash guard.

The story of the rescue actually begins at the Cairns AAF pilots' lounge, where the crash rescue section is on alert. E. M. Marshman, Federal Aviation Agency resident inspector at Fort Rucker, was chatting with the crash rescue pilots at about 1500 hours when he saw an aircraft go down about one-half mile off the end of runway 24. Marshman immediately alerted the rescue crew. The members of the section were running across the ramp to their helicopter when the crash bell sounded.

The tower gave Bosworth and MacDonald an immediate clearance for a direct east takeoff. The rescue chopper picked up and headed out at about 50 feet and 110 knots toward a column of smoke curling up 1 mile away.

Spotting the burning plane among the trees, Bosworth and MacDonald realized that looking for a place to land would require too much time. They hovered over the crash site and ordered the firemen lowered in the rescue bag.

Grant and Bailey, clad in asbestos hoods and bunker coats, were lowered with fire extinguishers and reached the stricken aircraft 3 minutes after the crash bell had sounded. They discovered the pilot strapped in and it was necessary to cut him loose. A minor explosion occurred in the engine compartment at this time.

The firemen dragged the pilot about 100 feet from the burning aircraft. The rescue helicopter had set down about 60 yards away and Bosworth and Letchworth brought up a litter and aid kit.

After first aid treatment, the injured pilot was placed aboard the helicopter and rushed to the hospital. Grant, Bailey, and McCall remained behind. A large explosion engulfed the downed plane in flames as the helicopter departed.

How about your unit—whatever its branch or mission? Comparatively speaking, does it reflect such professionalism?